on board now, the ambitious timetable laid out for the new institute calls for hiring 15 to 25 research staff in the first 100 days and 100 researchers by the end of the first year. "The goal is to put together a collection of individual scientists who have an interest in as quickly as possible moving from targets to treatments," he says. The institute will initially focus on melanoma and pancreatic cancer and then expand to other diseases, including diabetes.

Francis Collins, director of NHGRI, says, "The opportunities in translational research are incredibly broad right now, and entities such as TGRI will play a critical role in that future." –MARI N. JENSEN

Mari N. Jensen is a science writer in Tucson, Arizona.

CONDENSED-MATTER PHYSICS

Spintronics Innovation Bids to Bolster Bits

By just about any measure, technologists pushing to cram more data onto computers' magnetic hard disks have been on a roll. Over the past 4 decades, companies have gone from storing a few thousand bits of data per square inch of disk space (the standard industry measure) to tens of billions of bits in the same space today. That's driven the cost of storing each bit down by orders of magnitude, savings that have fueled the explosive growth of the Web, among other things. Now, a team of researchers at the State University of New York, Buffalo, reports an innovation that could keep the data-density gains rolling in for years to come.

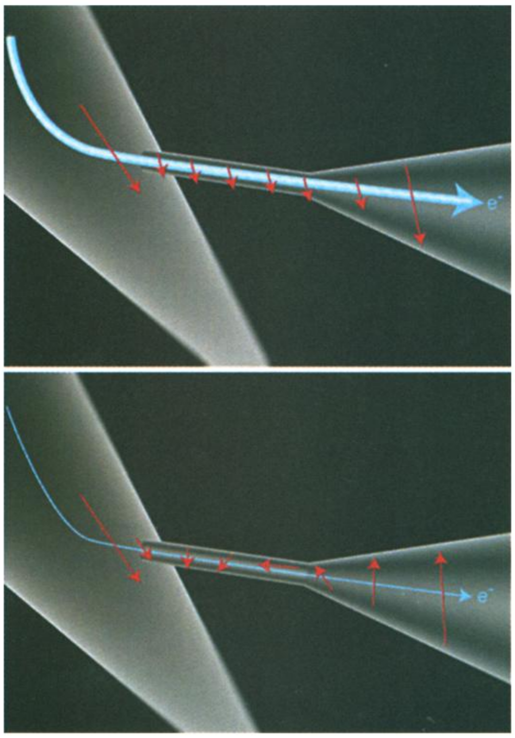
In the 1 July issue of *Physical Review B*, materials scientists Harsh Deep Chopra and Susan Hua report passing electrons through a cluster of magnetic atoms that bridge two magnetic wires. When the magnetic orientation of those electrons, also known as their spin, is the same as the magnetic orientation of the two wires, the electrons travel effortlessly through the cluster, a phenomenon known as ballistic magnetoresistance (BMR). But when the magnetic orientations of the wires point in opposite directions, electrons moving through the cluster from one wire to the other must quickly flip their spin. Because that's hard to do in the nanosized clusters, Chopra and Hua found that the measured electrical resistance jumped over 3000%, the largest such effect ever seen (see figure).

A related effect, known as giant magnetoresistance, forms the basis for the magnetic read heads found in nearly all computer hard-disk drives. As a read head moves above bits of magnetic data, changes in the magnetic orientation of those bits alters the electrical resistance of electrons flowing through the sensor, translating the magnetic data into a stream of electrical pulses.

Those changes in magnetic orientation produce only about a 100% change in resistance in the read head. The larger BMR effect could lead to smaller and more sensitive read heads capable of reading smaller magnetic bits. And that, in turn, could allow diskmakers to boost the storage density of disk drives to a staggering 1 trillion bits per square inch.

"This is a great discovery," says William Egelhoff Jr., a physical chemist at the National Institute of Standards and Technology in Gaithersburg, Maryland. "It's exactly what the disk-drive industry needs if it wants to maintain the growth rates in data-storage density."

Chopra and Hua weren't the first to spot BMR. Nicolás García and colleagues at the Consejo Superior de Investigaciones Científicas in Madrid, Spain, first described the effect in 1999. At the time, they saw only a 200% change in resistance, a number they have subsequently raised to 700%. García's team produced the effect by positioning two magnetic wires close to each other in the shape of a "T." They then used standard techniques to deposit magnetic atoms from a solution, forming a nanobridge between the two wires. Egelhoff says that García's team has done beautiful work in demonstrating the effect, but he says that their technique for making the bridges is "somewhat crude."



Tough going. Electrons breeze between two wires with the same magnetic orientation (*top*) but face resistance when the orientation of one is reversed (*bottom*).

That's where Chopra and Hua come in. Before depositing the metal bridge, they sharpened the tip of the wire, bisecting the top portion of the "T" to form an ultrafine point just 40 nanometers across. That allowed the bridge to meet the wire at a single, well-formed contact. Just why that should produce a higher magnetoresistance effect remains unclear, however.

Whatever the mechanism, Egelhoff notes that there is still a long way to go before the effect has a shot at revolutionizing data storage. Most important, he says, researchers must still learn to harness BMR to create magnetic read-head sensors. He is collaborating with García's team on the initial steps needed to do just that, a goal that Chopra's team is pursuing as well. If successful, the technique could extend conventional disk-drive technologies to storage densities that some labs are pursuing by much riskier, more exotic approaches. –ROBERT F. SERVICE

MALARIA

Ecologists See Flaws in Transgenic Mosquito

WAGENINGEN, THE NETHERLANDS—If a small band of molecular biologists has its way, the next few years might bring field tests of "designer mosquitoes," genetically modified so that they are unable to transmit diseases such as malaria. The goal would be to replace the natural mosquito populations ravaging developing countries. But at a workshop here last week,* 20 of the world's leading mosquito ecologists said, "Not so fast." Although lab science might be thriving, they said, huge ecological questions remain—and it's time funding agencies, which have enthusiastically endorsed the transgenic mosquito plan, started devoting attention and money to answering them.

Gathering in this Dutch university town, the group outlined a sweeping ecological research agenda, ranging from baseline population genetics to an emergency plan in case the transgenic critters run amok. Many of these issues have been deferred or overlooked by the molecular biologists developing the disease-fighting mosquitoes, said meeting organizer Thomas Scott of the University of California, Davis.

At least five U.S. and three European research groups are working on transgenic mosquitoes, with support from the U.S. National Institute of Allergy and Infectious Diseases (NIAID), the World Health Organization (WHO), and the MacArthur Foundation. After a slow start, the field took off

* "The Ecology of Transgenic Mosquitoes," Wageningen University and Research Centre, 26–29 June.

ILLUSTRATION: C. SLAYDEN

in 1998, boosted by new genetic engineering techniques (*Science*, 20 October 2000, p. 440). As they reported in the 23 May issue of *Nature*, Marcelo Jacobs-Lorena of Case Western Reserve University in Cleveland and his colleagues recently inserted an extra gene into *Anopheles stephensi*, a mosquito that transmits malaria in India, that made the insects resistant to mouse malaria. Others are tweaking the genes of *Aedes aegypti*, the mosquito that transmits dengue.

But the ultimate target is *Anopheles gambiae*, the main vector of the deadliest malaria parasite, *Plasmodium falciparum*, in Africa. Researchers hope to make resistance genes spread through natural mosquito populations by hitching them to a selfish piece of DNA called a transposon or to a strange bacterium called *Wolbachia* that sweeps through insect populations by manipulating its host's sex life. If this works, they will have created golden bugs that could save millions of lives—at least in theory.

Still a stretch. Making transgenic mosquitoes has become relatively easy—this larva carries the green fluorescent protein gene—but ecologists say this strategy is a long way from driving down malaria.

At the meeting, ecologists came up with a discouraging list of hurdles that could easily sink the plan. For example, will the new mosquitoes be able to compete for partners with their natural counterparts? (Past studies have shown that spending a few generations in the lab diminishes their sexual attractiveness.) How long would it take for a new resistance gene to penetrate the population, and would it be 100% effective in mosquitoes that carry it? (If not, the transgenic bug would barely make a dent in malaria incidence, suggests a model by Christophe Boëte and Jacob Koella of the Pierre and Marie Curie University in Paris.) In areas with multiple malaria vectors, would all the species need to be "treated"? And would *P. falciparum* develop resistance to the new genes, as it has to many drugs? Or could this be prevented if multiple antiparasite genes were used?

Studying many of these issues is problematic. Most researchers agreed that after cage experiments, some sort of pilot trial would be needed. But where? It must be a place from which mosquitoes can't escape. São Tomé, one of a handful of islands that form a republic off the east coast of Africa, has been suggested, and one meeting participant floated the idea of creating artificial "oases" in the Sahara desert. Even more vexing are some of the ethical and regulatory issues. Although it's unclear who would set the rules, a field test would have to meet safety standards as strict as those for vaccine trials, said entomologist Yeya Touré, malaria coordinator at WHO's Special Programme for Research and Training in Tropical Diseases—or perhaps even stricter, as it would expose people who had not agreed to participate.

Feeling "a bit like a ham sandwich on Passover," the only molecular biologist at the workshop, David O'Brochta of the University of Maryland, College Park, admitted that he and his colleagues have given little thought to these issues. But that reflects a lack of expertise rather than concern, he said, urging ecologists to join the work.

In the past, said meeting host Willem Takken of Wageningen University, granting agencies have not been impressed by old-style fieldwork such as counting mosquitoes or studying their feeding behavior. But at least NIAID is now convinced that the ecologists' input is urgently needed, says Kate Aultman, program manager for vector biology. Some at the meeting said that they were uncomfortable allying themselves too closely with a research program that faces such major problems. But most still preferred joining it to trying to beat it—if only because the research might be valuable regardless of whether transgenic mosquitoes ever take wing.

–MARTIN ENSERINK

CREDIT: JOHN R. CLAYTON/CDC

FISHERIES RESEARCH

Mixed Schools a Must for Fish?

Fish markets teem with neatly iced schools of similarly sized fish. The marked uniformity is often the result of two forces: customer demand for pan-sized portions and fishing regulations that limit harvests to older fish to preserve populations. But some biologists fear such selective culls could permanently alter the genetic makeup of wild fish stocks.

Now, two scientists have gone fishing in their laboratory to test that idea. And on page 94, they say they've netted data suggesting that fisheries managers should rethink their rules if they want to prevent

ScienceScope

Scientific Gold Mine? U.S. researchers are getting ready to dig even deeper into the possible uses of an underground science laboratory. The National Science Foundation (NSF) said last week that it will hold a 3-day workshop on subterranean science in September in Washington, D.C. And although the notice doesn't mention it by name, a controversial proposal to convert the shuttered Homestake Gold Mine in South Dakota into the world's deepest lab will be the invisible elephant in the room (*Science*, 15 February, p. 1213).

NSF is already mulling a nearly $300 million request from physicists to build the Homestake lab, which they say would be the perfect place to build giant detectors for studying neutrinos. But the project has become ensnarled in political, environmental, and cost concerns, and NSF reviewers have so far given little hint on how they view the bid.

Earlier this year, the White House asked the National Academy of Sciences to take a global look at proposed facilities for neutrino physics and underground science in general, with an eye toward avoiding duplication. Organizers say the conference, which they expect to be "75% about physics and astrophysics and 25% about other fields," including geoscience and the environmental sciences, will feed into the academy report. It is expected to shape attitudes toward the Homestake lab.

The report is due early next year. For meeting details, see www.physics.umd.edu/ness02.

Bailed Out After nearly a week in jail, two biology postdocs accused by the FBI of stealing commercial secrets from a Harvard lab (*Science*, 28 June, p. 2310) were released last week from a San Diego prison on $250,000 bail each.

Jiang Yu Zhu and his wife, Kayoko Kimbara, are expected to travel to Boston for an initial hearing on 17 July before a federal district court. In the meantime, they face an 8 p.m. curfew. Zhu, now at the University of California, San Diego, and Kimbara, now at Scripps Research Institute in La Jolla, California, could face 25 years in prison and $750,000 in fines if found guilty of conspiring to steal Harvard secrets and shipping Harvard property across state lines. A formal criminal indictment is likely to come later this month.

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