

## Hard-Liner's Triumph Puts Research Plans in Doubt

**TEHRAN**—Shapour Etemad was stunned by the victory of Tehran's hard-line mayor Mahmoud Ahmadinejad in last week's presidential runoff election. Like many intellectuals, Etemad, director of the National Research Institute for Science Policy in Tehran, had campaigned for a moderate government, adding his name to a public endorsement of former president Hashemi Rafsanjani. After Ahmadinejad's surprise landslide victory, Etemad was left wondering if he should resign his influential post and retreat to academia.

Many Iranians were troubled by the stark choices in this election. Ahmadinejad campaigned on a promise to breathe new life into the Islamic revolution, whereas Rafsanjani pledged to seek closer ties with the United States. Although Ahmadinejad has not aired his views on science, some researchers fear that his ascendancy could result in a curtailment of foreign collaborations, an accelerated brain drain, and a



**Unknown quantity.** A proponent of the Islamic revolution, President Ahmadinejad has not made known his views on science.

shift toward more applied projects.

That's not what Iranian scientists want to hear, given the distance they've come since 1979 when the Islamic revolution closed universities for 4 years. "We were completely isolated," says string theorist Hessamaddin

Arfaei, deputy director of research at the Institute for Studies in Theoretical Physics and Mathematics in Tehran. Stagnation deepened during the protracted Iran-Iraq war in the 1980s; afterward, U.S. economic sanctions slowed the recovery.

It's only recently that Iranian science has enjoyed a widespread renaissance. The number of foreign collaborations has risen threefold in the past 4 years, says Iran's deputy minister of science, research, and technology, Reza Mansouri. "Scientific output has skyrocketed since 1993," boasts Mohammad Javad Rasaei, dean of medical sciences at Tarbiat Modares University. Iran's share of global scientific output rose from 0.0003% in 1970 to 0.29% in 2003, with much of the growth occurring since the early 1990s, according to a study earlier this year in the journal *Scientometrics*. The analysis, led by immunologist Mostafa Moin of Children's Medical Center in Tehran, was based on ▶

### NANOTECHNOLOGY

## EPA Ponders Voluntary Nanotechnology Regulations

Last week, the U.S. Environmental Protection Agency (EPA) held its first public meeting to gauge sentiments about a proposed voluntary pilot program to collect information on new nanomaterials that companies are making. The agency got an earful.

More than 200 people gathered here at the Washington Plaza hotel to weigh in on the program, a possible precursor to guidelines that would mark the agency's first attempt to regulate nanotechnology. In a document released before the meeting, a coalition of 18 environmental and health-advocacy groups charged that a voluntary program would be inadequate to protect people from new chemical hazards. But most makers of nanomaterials applauded EPA's initial move as appropriate, because so little is known about the possible hazards of nanosized particles.

"The meeting was like the blind man feeling the elephant," says David Rejeski. He heads a new 2-year project at the Woodrow Wilson International Center for Scholars in Washington, D.C., on managing health and environmental impacts of nanotechnology. EPA and other agencies are still sorting out the scale of the challenge they face, Rejeski says.

Nanomaterials put regulators in an unfamiliar bind. With traditional chemical toxins, any two molecules with the same chemical formula look and behave alike. Two nanoparticles made of the same elements but of different sizes, however, may have drastically different chemical properties. Even particles of the same size and elemental composition can have very different properties, due to differences in their chemical architecture—for example, diamond nanocrystals and buckyballs shaped like soccer balls, both made of pure carbon. That diversity makes it a daunting task to sort out just which particles are hazardous to people and the environment and to control their production and release.

As a first step, EPA is thinking about asking nanomaterials makers to submit

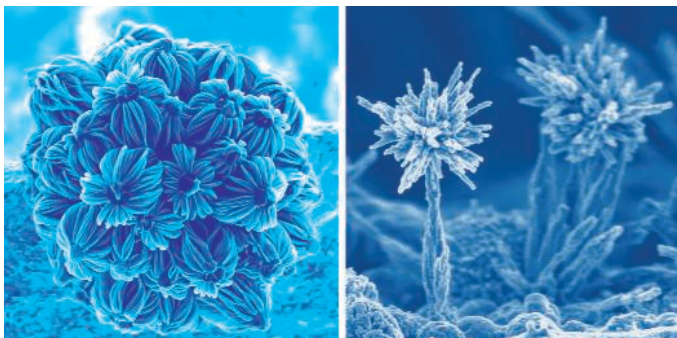
information on just what they are producing, how much is made, and possible worker exposure. "That's a good first step," says Sean Murdoch, executive director of the NanoBusiness Alliance in Chicago, Illinois. But Jennifer Sass of the Natural Resources Defense Council in Washington, D.C., argues that asking companies to participate voluntarily doesn't go far enough. "It's going to be tough getting these companies to be good corporate citizens without the threat of regulation hanging over their heads," Sass notes.

Nearly everyone agrees that far more information is needed. To get it, some groups are starting to call for increased funding for toxicity and health studies on nanoparticles. In a commentary in the 14 June *Wall Street Journal*, Fred Krupp, president of Environmental Defense, and Chad Holliday, chair and CEO of DuPont, argued that funding for environmental health and safety studies of nanotechnology should rise from its current level of 4% to 10% of the \$1.2 billion budget of the National Nanotechnology Initiative.

Rejeski argues that before a set dollar figure is agreed upon, policymakers need to decide what information they need in order to draw up nano regulations. Then, he says, they can determine how much money is needed to fill those holes. Rejeski adds that his team is currently drawing up just such an analysis and plans to release it later this summer.

—ROBERT F. SERVICE

With reporting by Amitabh Avasthi.



**Hazardous?** The sheer diversity of nanoparticles makes it hard to tell which ones pose risks.