als, says Fukuyama, "they can work immediately to get more female scientists involved in reviewing. There are a lot of things to do on both the long and short term." As in many countries, Fukuyama adds, "the most important thing is to increase the number of women in physics. And once we have them, we need to encourage them to stay."

To do that, says IUPAP President Burton Richter of SLAC, "it's essential that men help. There will be considerable resistance from men, who may feel that women are whining. If a male colleague says things have to change, [men are] more likely to say yes, it's true." These days, such resistance might actually be lower than in the past, what with physics enrollments shrinking worldwide and many departments trying to woo students by, for example, introducing degree programs that combine physics and business. The time may be ripe for engendering a welcome for women in physics, says Urry. "It's a good moment. Frankly, I think [male physicists] are interested."

TONI FEDER

Orbach Brings Enthusiasm for Research and Desire for Increased Funding to Office of Science

The DOE's new Office of Science director expresses particular interest in nanoscience and fusion research and wants the US involved in ITER.

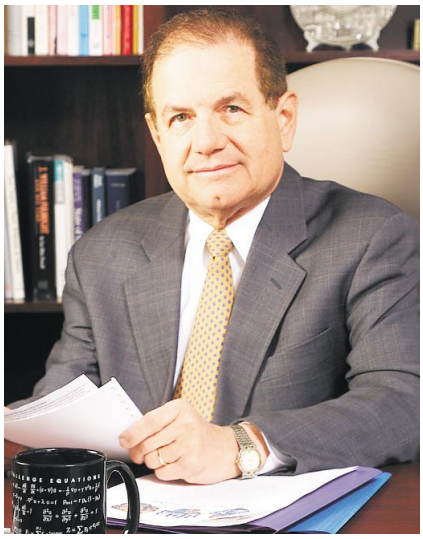
Two weeks after being sworn in as the director of the Department of Energy's Office of Science, theoretical physicist Raymond Orbach was still brimming with excitement about his new job. "First of all, the science in the Office of Science is beautiful," Orbach responded when asked why he'd left his previous position as chancellor of the University of California, Riverside. DOE is a "magnificent enterprise and it's just delightful to be a part of it," he said to a small group of journalists gathered around a table near his new office. "I'm like a kid in a candy factory."

After more than 40 years of working as a self-described "bench scientist" supported in large part by federal funds, Orbach said "this was an opportunity for me to try and return the wonderful support I've had and hopefully respond to the needs of the government in terms of science." While he was enthusiastic about his new circumstances, he was not Pollyannaish. The Office of Science has a substantial $3.3 billion budget, but the administration's fiscal year 2003 budget proposal calls for only a 0.1% increase for the office, and overall DOE R&D funding would actually decline by 0.5%.

"We have essentially a flat budget, as have the physical sciences across the government for the last decade, and it's become very tough," Orbach said. "I know what it's like from a university perspective. It's been very difficult to support the research efforts at universities . . . and it's been no less difficult in the [DOE] laboratories. There is a special role that I see the Office of Science playing in the support of basic research in the United States."

Orbach said one of his key priorities is "developing new initiatives that will build on the base of science to provide more funding and more support for university science and for the laboratories." He said he was "in tune" with calls on Capitol Hill to increase physical science funding above the level proposed by the administration. While his funding goals for the Office of Science are not as lofty as the five-year budget doubling that is occurring at the National Institutes of Health, Orbach would like to see his budget increase by 30% or 40% over the next five years.

He is aware of concerns among physical scientists that the large jump in the NIH budget—17% proposed for FY 2003—and the flat funding for most physical sciences is creating an overall imbalance in federal science funding. The seeming imbalance can be explained in part by the science itself, he indicated. With the dramatic advances in biological sciences, especially in the new field of protein research called proteomics and in the wide-ranging bioinformatics, the traditional divisions between biology, chemistry, physics, and other fields of science are blurring, Orbach said. When the Spallation Neutron Source comes online, he said, "there will be as many biologists as there are condensed matter physicists and chemists" using the machine. The same is true of synchrotron light sources, he said. "I believe there are more biologists working with light sources for structural determinations and dynamics [in cells] than there are physicists."



UC RIVERSIDE

RAYMOND ORBACH

Enthusiasm for both physical and biological sciences is high in the administration and Congress, he said, and the success of the health sciences depends on the "vitality of the fundamental physical and life sciences. They are the underpinnings of health science. What I hope is that physical and life sciences can be funded at a sufficient rate that we cannot only do our thing, but also help the health sciences do their thing." He also said that he is an "advocate of a diverse funding base for science. I think the great strength of the United States science programs is the multiagency support." Having science funding spread over several agencies, Orbach said, "avoids the possibility of fads or attitudes that a single funding agency for science might develop. I think in large part the vitality of American science can be laid to the diversity of funding sources within the federal government."

Orbach stressed nanoscience and fusion as two research areas in which he is particularly interested. There is $24 million in the administration's budget proposal to begin construction of the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory and, Orbach said, that center will be the first of five nanoscience centers to be supported by his office. The other four are expected to be at Lawrence Berkeley National Laboratory, Sandia–Los Alamos (run jointly by the two labs), Argonne National Laboratory, and Brookhaven National Laboratory. "What we will be creating is a nanoscience network that uses the

full force and power of the labs to illuminate the materials and the science. These [centers] will be complementary, not duplicative."

Orbach was also enthusiastic about fusion research and said, "we're approaching the point where burning plasma is a possibility." He praised the Joint European Torus, a fusion machine located near Oxford, England, as "remarkably successful," and said it has set the stage for development of the International Thermonuclear Experimental Reactor. The US completely pulled out of the ITER project in 1999, partly due to costs, but the main ITER partners—Europe, Japan, and Russia—have moved forward with plans for a scaled-down program that, at about $5 billion, is significantly cheaper than the original proposal (see PHYSICS TODAY, March 2000, page 65).

Orbach said he is "very much in favor" of the US rejoining ITER as a junior partner. "I think the opportunities for burning plasma are so exciting that if we don't have ITER, the problem facing us would be to construct a burning plasma facility within the United States. That is an expensive business. Just to do burning plasma would be more than $1 billion just in terms of a machine."

Using US involvement in the Large Hadron Collider at CERN as an example of a good international program, Orbach said he assumed with ITER that "we could come in at a reasonable support level that has to be negotiated. What would happen is if the Secretary [of Energy] signs on and the president supports it, we would then go into negotiations with the other ITER partners and try to define the American participation. It makes sense for us to be a junior partner."

Orbach also wants the Office of Science to play a more significant role in science education. He noted that the number of PhDs in science is dropping, and K–12 science scores are falling. "This is not something one agency can fix, but I would like to see the DOE use its resources for education, and do it primarily through our labs. We have a unique strength in our laboratories, and in teacher training and support they can play a very special role."

The fundamental role of DOE is US security, Orbach said, and that means more than just military security. "It is also energy security and the security of our economy. Security means this country can continue as a major world power, and one of the areas that's most profound is science. I see the Office of Science as being responsible for the energy and economic security of this nation." **JIM DAWSON**

Visionaries Gather to Honor John Wheeler

Why the quantum? How come existence? It from bit? A participatory universe? What makes meaning? Those are some of the "Really Big Questions" of John Archibald Wheeler. Both Wheeler and his RBQs were the focus of the irresistibly titled "Science & Ultimate Reality" symposium that took place from 15 to 18 March near Princeton, New Jersey.

Wheeler has had a long and remarkable career in physics teaching, research, and public service. In 1939, he and Niels Bohr provided the first theory of nuclear fission. In the 1940s, Wheeler worked on the Manhattan Project, and in the 1950s, he helped develop the hydrogen bomb. He was central to the revival of general relativity in the 1960s; in 1967 he coined the term "black hole" and eventually convinced his colleagues of the phenomenon's reality. In 1965, he and Bryce DeWitt launched the field of quantum cosmology. The list goes on.

The symposium was the brainchild of Charles Harper, planetary scientist and executive director of the John Templeton Foundation. According to Harper, the foundation encourages and explores research in ultimate reality, whether it be in theology, philosophy, or deep issues in physics. The foundation spent about $700 000 on the symposium project, which next year will also yield a book with 30 invited chapters, most of them written by the symposium's participants.

More than 300 individuals, most of them physicists, attended the long-weekend affair. The tone was set with the first plenary talk by the University of Vienna's Anton Zeilinger. He discussed delayed-choice experiments, first proposed by Wheeler in 1978, and their meaning for quantum reality. Lively discussions ensued, and spilled out into the hallway.

Throughout the symposium, in fact, discussions and debates were all-embracing, simultaneously brawny and nimble, and generally cordial. Speakers in the four sessions—quantum reality, theory; quantum reality, experiment; big questions in cosmology; and emergence, life, and related topics—all touched on Wheeler's RBQs, his research, or both. At the sessions, in the halls, and at meals one heard buzz about quantum gravity, black holes, time's arrow, a gravity-wave transducer, parallel universes, the nature of information and its role

THOMAS DUNCAN PHOTOGRAPHY

JOHN ARCHIBALD WHEELER and the Young Researcher Competition finalists. From left to right: Vlatko Vedral (Imperial College, London); Mary Rowe (NIST, Boulder); Nicole Bell (NASA/Fermilab); André Stefanov (University of Geneva); Olga Khovanskaya (Moscow State University); Jeremy O'Brien (University of Queensland); Jianwei Pan (University of Vienna); Jonathan Oppenheim (The Hebrew University, Jerusalem); Michael Murphy (University of New South Wales); Wheeler; Mark Topinka (Stanford University); Anita Goel (Harvard University); Steven Gubser (Princeton University); Raphael Bousso (University of California, Santa Barbara); and Fotini Markopoulou (University of Waterloo, Canada). Not shown is Jiangping Hu (Stanford). This is a digital composite of two photos.