ment for close to 20 years."

It is a fact of life in quantum mechanics that an observation or measurement alters or destroys the object that is being observed. But theorists know it need not be so. In principle it should be possible to observe a quantum system without destroying it, and repeat the observation later and get the same result. Achieving nondemolition is extremely difficult, however, because of the fragile nature of quantum states. Over the past decade or so, several teams have managed it using interferometry, a technique that involves blending two light waves in such a way that minute changes in either of the two beams modify the recombined beam. Such a setup can reveal the impact of a "signal" light beam that disturbs the path of one of the other two beams before they are combined. The signal beam continues unperturbed, but the imprint of its passing is recorded in the altered interference pattern.

> **"They have implemented one of the goals ... which has defined the field of quantum measurement for close to 20 years."**
>
> **—Wojciech Zurek**

This technique requires bright light beams. The ENS researchers wanted to see if they could achieve nondemolition with a single photon, much too feeble to disturb the path of a detection beam. Instead, they harnessed the sensitive quantum energy ladder of electrons around an atom. The first step is to trap a photon. The researchers built an open-sided cavity 3 centimeters long and 5 centimeters in diameter bounded at either end with spherical niobium mirrors, which reflect photons of the correct microwave wavelength. Then they cooled the trap to 1 degree above absolute zero, still warm enough to guarantee a single thermally induced microwave photon bouncing between the mirrors.

To detect the photon, the researchers shot a rubidium atom through the cavity. But before they sent it on its journey, the atom was pumped up with energy, so that its outermost electrons were not in their lowest energy states but in orbits far from the nucleus, a state known as a Rydberg atom (*Science*, 19 July 1996, p. 307). In this long-lived, bloated state, the atom is very sensitive to microwaves, guaranteeing the strongest possible interaction with any microwave photons lurking in the cavity.

The aim was to use the swollen Rydberg atom as a detector to see if a photon is resident, and if it is to leave it pinging around within the cavity in its original state. The cavity is just the right size, and the atom's speed carefully set, so that during its passage through the cavity there is just enough time for the atom to absorb the photon and reemit it before the atom reemerges.

At first sight, the exiting atom appeared unchanged from when it entered. "So you have the feeling that nothing has happened," says Haroche. But the cycle of absorption and emission does leave an imprint on the atom wave by altering its phase: The exiting atom was now out of step with its state on entry into the cavity. A separate system compared the phases before and after, revealing a half-wave phase shift—the signature of a cavity that contains a single photon. The researchers found that sending a second atom through the cavity produced the same result. "It shows that the first atom has made a measurement and left the photon behind for the second atom to read it," says Haroche.

Other physicists have lauded the technical skills of the ENS team. "It's an amazingly complex experiment, and there are several pieces of it, each of which is an amazingly complex experiment alone," says Zurek. "They have thought up some neat tricks to solve the experimental difficulties they're faced with," adds Oxford University's Andrew Steane. "It's a piece of work which probably no one else in the world could have done."

–ANDREW WATSON

Andrew Watson is a science writer in Norwich, U.K.

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EUROPEAN UNION

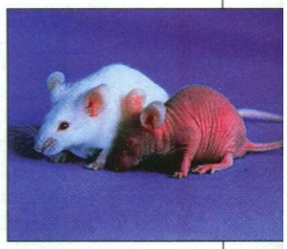
Belgian Socialist Tapped To Head EU Research

Philippe Busquin, a Belgian Socialist Party official with a background in physics, has been selected to become the European Union's (EU's) new chief research executive. Romano Prodi, the European Commission's incoming president, last week presented his new team of commissioners, with Busquin as his candidate for research commissioner. After holding hearings, the European Parliament is scheduled to vote on Prodi's new team by mid-September.

In his new job, Busquin will lead the EU's research directorate—known up to now as DG-XII—and administer the 4-year, $17 billion Fifth Framework research program. The portfolio had previously included education, but—contending that research and technology "represent a full portfolio"—Prodi

ScienceScope

Mouse House West A leading purveyor of lab mice is going coast to coast. The Jackson Laboratory of Bar Harbor, Maine, announced this week that it will open a West Coast outpost in cooperation with the University of California (UC), Davis, in a bid to make genetically customized mice more easily available to researchers across the western United States. The new $10.6 million center, to be housed in several refurbished buildings, will raise up to 30,000 specially bred mice a year. The lab already ships about 2 million mice annually from its Maine headquarters, which stocks over 2300 varieties. The strains include "models" for many human diseases, from epilepsy to cancer.



Researchers at the host campus are looking forward to the rodent invasion. The school's medical and veterinary programs "will be greatly enhanced" by the ready supply of research subjects, says Stephen Barthold, director of the UC Davis Center for Comparative Medicine. The first colonies are scheduled to arrive early next year, once renovations—including the creation of special disease-free nurseries and air-cleaning systems—are complete.

Genomics Boom? France is poised to give a major boost to genome research. Government officials are hoping to give the nation's $46 million genome program about a 50% raise next year and launch at least four new gene research centers, or "genopoles," to complement an existing facility in the Paris suburb of Evry. The draft 2000 budget plan also calls for creating consortia teaming government agencies with private companies, especially biotech start-ups, which could ultimately hike total genome research spending to $150 million a year.

Gene jockeys won't know how much cash they will get until this fall, when Parliament votes on the 2000 budget. Still, "there is a lot of potential" for growth, says molecular biologist Pierre Chambon, president of the genome program's scientific advisory council. "The question is whether it is going to be supported at a proper level."

Contributors: David Malakoff and Michael Balter