embryo research. The panel delivered its report in May, and last week the Department of Health unveiled both the report and the government's response. The department is now discussing with the research councils, which dole out much of the government's science funding, how to fund more human embryo research.

Topping the panel's list of recommendations is a call for allowing researchers to extract embryonic stem cells, which can be coaxed to form various cell types. Culled from 5- to 6-day-old embryos, such cells might be grown in the test tube into tissues suitable for transplantation. The hope is that embryonic stem cells would serve as a stopgap until scientists learn to reprogram adult cells to serve as stem cells. "Winding the clock back on adult cells is very much the Holy Grail of stem cell research," says Donaldson. But scientists shouldn't count on adult cells, warns Peter Andrews of the University of Sheffield, who studies human embryonal tumor cells. "In the end," he says, "the therapeutic approach will be the one that's easiest to follow."

The report also advocates the limited use of nuclear transfer techniques as a source of stem cells. To ensure that tissue grown from stem cells is not rejected as foreign by a patient's immune system, a nucleus from one of the patient's own cells would be fused with an egg that had its nucleus removed, and the egg would then be prodded to divide. However, clinical research to test therapeutic cloning is a long way off and may require additional legal safeguards, says Donaldson: "We're talking about research at this stage, not treatment." Making babies from cloned human embryos—the reproductive cloning that the sheep Dolly made famous—would remain a crime under British law.

A third line of research backed by the report would explore the feasibility of preventing the 50 or so diseases caused by mutations in the genes carried by mitochondria, the powerhouses of the cell. Mitochondria are handed down only by the mother, and one approach might be to transplant the nucleus from an egg of an affected woman into an egg from a normal donor stripped of its nucleus, and then fertilize the hybrid egg.

Donaldson says the recommendations do not break new ethical ground but simply expand research already allowed under current law. Still, rather than risk defections, the ruling Labor Party plans to allow Parliament members to vote their conscience on the sensitive issue.

The battle lines are already drawn: Opposition Member of Parliament (MP) Liam Fox, a physician who serves as the Conservative Party's "shadow" health secretary, has come out against therapeutic cloning. He has an influential ally in Cardinal Thomas Winning, head of the Roman Catholic Church in Scotland, who in the 20 August *Sunday Telegraph* equated therapeutic cloning with killing human beings and called on MPs to outlaw it.

Andrews, who has received heart-wrenching phone calls from people whose loved ones suffer from diseases that might be treated someday with stem cell–derived tissue, hopes the scientific argument will prevail: "If we don't start investigating, we aren't going to get the answers we need."

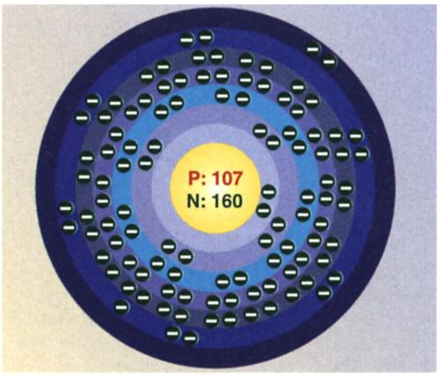
–RICHARD STONE

NUCLEAR CHEMISTRY

Element 107 Leaves The Table Unturned

Hard as it is to make new elements, it's a lot easier than figuring out how they behave chemically. Consider element 107, bohrium. It was first glimpsed in 1976 by high-energy physicists at the Joint Institute for Nuclear Research in Dubna, Russia. Not until this week, however, did an international team of chemists report on the first successful analysis of its chemical properties. "This is exceptional work," says Walter Loveland, a nuclear chemist at Oregon State University in Corvallis, calling the Swiss-led effort "a unique event and a serious advance in chemistry."

The results, announced at a meeting of the American Chemical Society,* show that bohrium behaves almost exactly as theorists predicted it would. "Bohrium is boring," says team member Andreas Tuerler. But that



No threat. Despite its complex structure, bohrium upheld the chemical status quo.

straight-arrow comportment, he adds, is itself something of a surprise.

To predict the properties of unknown elements, chemists consult the periodic table, a chart that sorts elements into families according to the arrangement of electrons in their reactive outer shells. For the 115-odd known elements, the table works uncannily well. But sooner or later, physicists believe, it is bound to become a victim of Einstein's theory of relativity.

The more massive an element is, they point out, the faster its electrons swarm the nucleus. Eventually, the electrons should start to show relativistic effects—changes of mass that will distort the shape of the swarms. Those distortions should give ultraheavy elements properties that could not be predicted by looking at their lighter kin. Elements 105 and 106 showed hints of unruly behavior, and scientists were eager to see if bohrium would be the straw that broke the camel's back.

Testing the chemistry of such elemental heavyweights, however, is exceedingly difficult, largely because the unstable nuclei at their cores fragment into smaller, more stable "daughter nuclei" almost the instant they come into being. A bohrium nucleus created in 1981 lasted only 9 milliseconds—far too short to run through chemical experiments. Fortunately, single elements can come in various flavors, or isotopes, each of which harbors a different number of neutrons. And some isotopes live longer than others.

So nuclear chemists Tuerler, Heinz Gäggeler, and their colleagues at the Paul Scherrer Institute in Villigen, Switzerland—along with team members from Germany and the United States—smashed a beam of neon atoms into a berkelium target, creating two new bohrium isotopes. One of those, ^{267}Bh, possessed a half-life of 17 seconds—long enough to make it an excellent candidate for testing its chemical reactivity.

From its electronic structure, nuclear chemists judged that ^{267}Bh should behave similarly to other elements in group 7 of the periodic table, such as technetium and rhenium. To test that hypothesis, Tuerler's team swept the atoms directly from their production facility into a 1000°C flow chamber, where they met up with hot oxygen and hydrochloric acid (HCl), gases that react readily with technetium and rhenium. What was left then passed through a chromatography column cooled to a comparatively chilly 70° to 180°C. Bohrium by itself can't make this journey in the cold, as it will quickly fall out of the gas and settle on the sides of the apparatus. But if it were anything like technetium and rhenium, it would continue to float freely if it combined with oxygen and HCl to make BhO_3Cl, barium oxychloride.

That's exactly what the researchers found. Running day and night for a month, the experiment produced only six atoms of the long-lived ^{267}Bh. But each atom flew through the full chemical separator, where its fingerprint-like decay pattern was picked up by detectors. Bohrium's chemistry was nailed, and the element certified as an obedient member of group 7. The results preserve the periodical table—for now.

–ROBERT F. SERVICE

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* 220th ACS National Meeting, Washington, D.C., 20–24 August.