

REPRODUCTIVE SCIENCE

Human Cloning Plans Spark Talk of U.S. Ban

U.S. lawmakers have renewed their efforts to ban human reproductive cloning after hearing last week from two groups that say they intend to produce a human clone.

Several bills were introduced 2 years ago after a physicist, Richard Seed, made a widely publicized claim that he would attempt to clone a human. But scientists



Pushing the envelope. Fertility researcher Panos Zavos (right) promised to screen human embryos created by cloning for possible defects. MIT's Rudolph Jaenisch (left) says screening for some defects is impossible.

warned that loosely worded legislation could stifle a broad range of important health research, and no bill was passed (*Science*, 20 February 1998, p. 1123). More recently, the U.S. Food and Drug Administration (FDA) has said it would prohibit any attempts at cloning because the procedure is unsafe. But at a 28 March hearing of the House Energy and Commerce Subcommittee on Oversight and Investigations, lawmakers worried that FDA's authority could be struck down in court, or that it might not be able to prevent secretive efforts to clone a child. "It is my view that the risk is so grave ... that we will have to act," said panel chair Representative James Greenwood (R-PA).

The hearing featured several experts on animal cloning as well as representatives from two groups that say they are attempting to produce a human baby using nuclear transfer techniques. That's the technology used to create the sheep Dolly as well as cloned goats, cattle, mice, and pigs. Scientists remove the nucleus of an egg cell, replace it with a nucleus from the animal they wish to clone, and then jump-start embryo development with an electric shock or chemical signals.

Chemist Brigitte Bossilier of Clonaid, an organization founded by the Raëlian religious movement, spoke about the company's plans to transfer the nucleus of a frozen cell taken from a baby that died after surgery. Bossilier

testified that the company's scientists, working in a secret location in the United States, had been practicing removing nuclei from cattle eggs but have not yet begun to work with human cells. She told the panel that the developmental problems seen in animal clones would not necessarily occur in humans.

Infertility researcher Panos Zavos of the Andrology Institute of America in Lexington, Kentucky, who has announced his intention to produce clones for infertile couples, told the committee that he and his colleagues would carefully screen embryos for abnormalities during gestation. "We would not step on dead bodies or deformed babies" to pursue the technology, said Zavos, who is leading work in an undisclosed country.

But developmental biologist Rudolph Jaenisch of the Massachusetts Institute of Technology's Whitehead Institute told lawmakers that Zavos's and Bossilier's description of the risks was "totally irresponsible and misleading." He said he suspects that all animal clones so far—even those that seem normal—have subtle defects in the brain and other organs. Although scientists are not yet sure, Jaenisch thinks a gene regulation process called DNA methylation goes awry in the cloning process. Currently there is no test for methylation abnormalities, he said.

FDA's Kathryn Zoon testified that her agency has jurisdiction over human cloning as part of its oversight of biological products. But several lawmakers worried that her argument sounded similar to the FDA's justification for regulating tobacco, which courts struck down. Several members also questioned the agency's ability to act quickly. Despite extensive coverage of Clonaid in the press, it wasn't until 2 days before the hearing that the FDA told Bossilier in a letter that Clonaid must obtain FDA approval before proceeding with its cloning efforts. Bossilier has not yet responded.

The testimony "has raised our level of interest in legislating in this area," said Representative Billy Tauzin (R-LA), chair of the parent Commerce committee. Greenwood said that he and Tauzin would soon introduce legislation to regulate attempts at human cloning. On the day of the hearing, Representative Brian Kerns (R-IN) introduced a bill that would impose fines or prison terms for anyone who undertook human nuclear transfer experiments "with the intent of implanting the resulting cellular product into a uterus."

Tim Leshan of the American Society for Cell Biology says that Kerns's bill is narrow enough not to hobble mainstream research.

But he warned scientists to monitor its path closely. The wording "may seem fine in the beginning," Leshan says, "but you never know what could happen in committee or on the floor."

One scientist who testified said that he would favor a carefully worded ban on reproductive cloning. "We don't know how far human clinics have gone," explained developmental biologist and cattle cloning expert Mark Westhusin of Texas A&M University in College Station after the hearing. "For now ... it looks like we're going to need these types of regulations to get some control over it."

—GRETCHEN VOGEL

STEM CELL POLICY

Canadian Panel Aims For Middle Ground

OTTAWA—New guidelines proposed last week by a blue-ribbon committee would allow Canadian scientists to derive stem cells from embryos left over from fertility treatments or fetal tissue obtained from elective abortions. The proposal is less restrictive than U.S. guidelines currently under review by the Bush Administration.

Alan Bernstein, president of the Canadian Institutes of Health Research (CIHR), which formed the panel, says that the proposed guidelines would allow researchers to explore such questions as what makes a cell commit to becoming a particular type of tissue and whether stem cells can be used "to actually cure diseases." Adds Mick Bhatia, who works with blood stem cells at the John P. Robarts Institute in London, Ontario, "we certainly would be happy if the CIHR would



Tipping the balance. Janet Rossant says the panel weighed benefits and risks of using embryos.

fund research in this area."

U.S. policy, which is being reviewed by Health and Human Services Secretary Tommy Thompson, requires government-funded scientists to obtain embryonic stem cells from private sources. The Canadian panel took a more lenient approach, but it didn't go as far as U.K. rules, which allow scientists to create

embryos for research purposes. "In developing the [final] guidelines, the question is whether the benefits outweigh the controversial aspects of using embryos for research of this sort," says panel chair Janet Rossant of Mount Sinai Hospital's Samuel Lunenfeld Research Institute in Toronto.

In weighing that balance, the 10-member panel opposed the donation or sale of gametes to create embryos for the sole purpose of generating stem cell lines. It also urged a moratorium on creating human embryos by somatic cell nuclear transfer, saying that the underlying science is flimsy and that the practice would inevitably lead down a slippery slope to human cloning. It suggested forming a national advisory body to oversee stem cell research, both public and privately funded, and possible licensing of researchers. Such an oversight body is expected to be part of long-promised federal legislation on reproductive technologies.

Antiabortion groups have already lined up against the guidelines. "We're well aware of the utilitarian argument, that [fetal tissue from elective abortions and embryos from fertility treatments] are going to be discarded anyway," says Tim Bloedow, spokesperson for the Campaign Life Coalition. "But we do not feel it's right to use that tissue for this kind of research."

The guidelines will go before the CIHR governing board this fall. Issues still to be resolved include whether to allow donors to select a particular research lab and whether to require consent from the woman who had an abortion or the individuals whose gametes were used during in vitro fertilization. Those gametes usually come from an anonymous donor, notes committee member and Dalhousie University bioethicist Françoise Baylis.

If the CIHR board approves the guidelines, Bernstein foresees a boom in stem cell research once money becomes available. Bhatia agrees that interest is high, but he also hopes that the final guidelines will satisfy an ethical "comfort level" among the general population.

—WAYNE KONDRÓ

Wayne Kondro writes from Ottawa.

ASTRONOMY

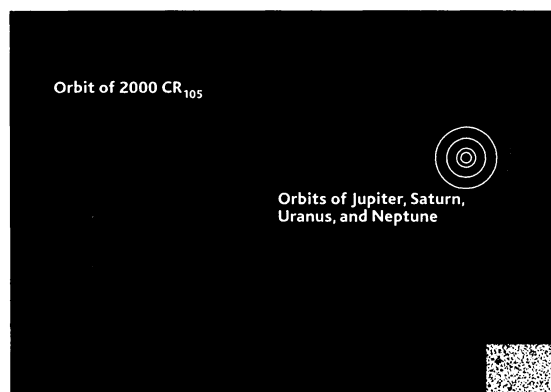
Comet's Course Hints At Mystery Planet

A supercomet following an unexpectedly far-flung path around the sun suggests that an unidentified planet once lurked in the outermost reaches of the solar system, an international team of astronomers reports. What's more, the scientists say, the mysterious object may still be there. "This is the first strong evidence that somewhere out there, there once was something big," says Hal Levison of the Southwest Research Institute in Boulder, Col-

orado. "It's a very important result."

The giant comet, known as 2000 CR₁₀₅, measures some 400 kilometers across. It is one of the hundreds of known trans-Neptunian objects (TNOs)—icy leftovers from the early solar system that populate the Kuiper Belt, a flattened region beyond the orbit of Neptune, the outermost giant planet. According to most planetary scientists, distant Pluto is the largest member of this population.

Some TNOs move in vast, elongated orbits. Current wisdom holds that they have been scattered into their eccentric trajectories by the gravitational pull of a giant planet, probably Neptune. If so, basic orbital me-



Whodunit? Far-ranging orbit of comet 2000 CR₁₀₅ is hard to explain by gravitational forces of the planets as we know them.

chanics dictates that these "scattered disk objects" should swing nearest the sun at perihelion points close to Neptune's orbit, some 4.5 billion kilometers from the sun. But comet 2000 CR₁₀₅, first discovered in February 2000, doesn't follow this script.

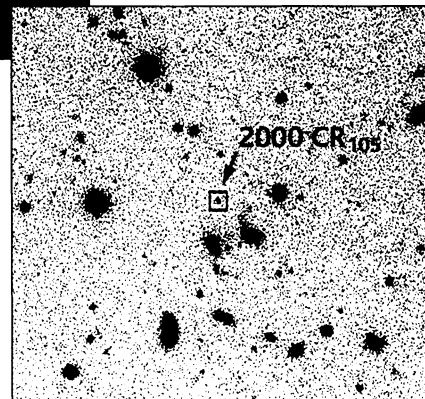
Brett Gladman of the Observatoire de la Côte d'Azur in Nice, France, and his colleagues have discovered that the giant comet's orbit is much larger and more distant than astronomers had assumed. Their observations reveal that 2000 CR₁₀₅ orbits the sun in 3175 years and never comes closer than 6.6 billion kilometers—well beyond Neptune's orbit. The farthest point of the highly eccentric orbit lies 58.2 billion kilometers from the sun—13 times as far as Neptune. "[This is] the first [scattered object] beyond the dynamical influence of the giant planet system," Gladman and his colleagues write in a paper submitted to the journal *Icarus*.

So how did it get there? One possibility is that 2000 CR₁₀₅'s orbit evolved into its freakish shape gradually, due to small, periodic gravitational nudges from Neptune. Computer simulations imply that such a "diffusive chaos" scenario is unlikely, Levison says, but Gladman says it can't be ruled out. "It's hard to quantify," he says. "There's even disagreement about this among the co-authors of the paper."

The alternative is that the supercomet was hauled into its present orbit by some massive object still farther from the sun. The object might have been Neptune itself: According to some theories, the planet once resided in a much more eccentric orbit and could have created havoc in the distant parts of the solar system. Or maybe there has been a transient population of massive planetary "embryos," formed in the early days of the solar system and expelled later on.

The most exciting possibility is that a planet-sized body still hides in the outer solar system. "A Mars-sized body [at an average distance of some 15 billion kilometers] could scatter a body like 2000 CR₁₀₅ to its present orbit," Gladman and his colleagues write in their *Icarus* paper. Unlike Mars, the planet would consist mainly of ice. Because its high mass would protect it from orbital disruptions, the astronomers say, it could still be around.

"I'd love to find proof that this is true," says Alessandro Morbidelli, a colleague of Gladman in



Nice who is not on the team. "Unfortunately, this object [2000 CR₁₀₅] doesn't constitute a definitive proof yet." On the other hand, Morbidelli stresses, a Mars-sized body 15 billion kilometers away would not measurably affect the orbits of the known planets, so it could well have passed unnoticed. "There's no direct or indirect observational evidence that these objects can't exist," he says.

But Levison doesn't like the idea of an undiscovered Mars out there. "It's not clear how it would have formed," he says. "I would be surprised if anything much larger than Pluto would be found. But of course I could be wrong." Large or small, astronomers agree that whatever nudged 2000 CR₁₀₅ into its large, distant orbit is bound to have done the same to other TNOs. "Finding more would give us a better idea of how they got there," Levison says.

—GOVERT SCHILLING

Govert Schilling is an astronomy writer in Utrecht, the Netherlands.