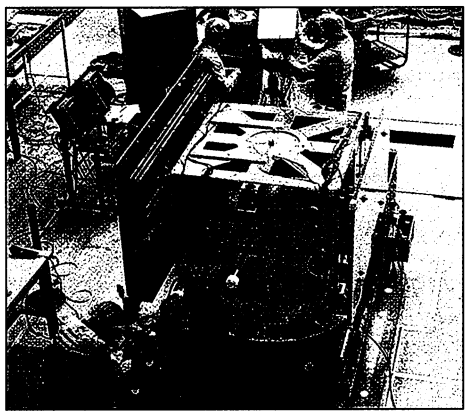


Fine-tuning. Europe's Smart-1 undergoes tests in the Netherlands.

CREDITS: (TOP TO BOTTOM) ESA; DAVID JENNINGS/AP

however, disagree. Although the mission "will create a massive data set on the moon, much of it unfortunately would not add materially to the things we already know," says lunar researcher Wendell Mendell at NASA's Johnson Space Center in Houston. Mizutani counters that "the quality and precision of the Selene instruments will provide much better data than those obtained by previous or existing observations."

A second Japanese probe, the $100 million Lunar-A, will swoop to within 40 kilometers of the surface in 2005 and launch two "penetrators"—80-centimeter-long projectiles that will pierce the surface to a depth of up to a few meters. Positioned on opposite sides of the moon, the sensors will monitor seismic waves traveling through its core. Analysis of the waves should reveal the size of the moon's core and determine whether or not it is liquid. Sensors on the penetrators will also measure heat flow through the crust, essentially taking the moon's internal temperature. "These geophysical data would be tremendously important toward understanding the moon as a planet," says Mendell.

The aim of ESA's more modest Smart-1 is to test new technologies, such as solar-powered ion propulsion, for later missions including ESA's Bepi-Colombo probe to Mercury. After the $80 million spacecraft is launched at the end of 2002, it will take 16 months to reach the moon, using only sunlight to drive it. Solar panels will provide the power to ionize xenon atoms and fling them out the back of the craft. "It is the first time that it will be used as a primary means for transportation," says Foing, ESA's project scientist for Smart-1.

Smart-1's tiny suite of six sensors, weighing only 15 kilograms in all, may help explain the moon's origin. In the most widely accepted theory, the moon is a bit of Earth broken off by a collision with a Mars-sized object. If so, the relative abundances of the moon's common constituents—iron, magnesium, and aluminum—should match those on Earth. Smart-1 will create a global map of abundances. The most important ratio is magnesium to iron, says Manuel Grande, a space physicist at the Rutherford Appleton Laboratory near Oxford: "That number really constrains whether the Earth and moon come from the same place."

Just as Cold War politics whipped up the moon frenzy in the 1960s, political forces may be behind the upcoming moon shots, some analysts contend. "The Selene mission ... is really the first step toward a resource-oriented commercial development," contends Mendell. Mizutani, however, insists it is far too early to talk about exploiting the moon. "We will need more basic study," he says. **–ALEXANDER HELLEMANS**

Alexander Hellemans is a writer in Naples, Italy.

STEM CELL RESEARCH

Reports Give Green Light in Australia, Israel

BERLIN AND MELBOURNE—Two countries at the forefront of work on human embryonic stem (ES) cells, Australia and Israel, have just recommended policies to ease the way for their researchers.

After 2 years of deliberation, an Australian government committee has endorsed legislation that would allow both ES cell research and the derivation of ES cells from unwanted embryos created during fertility treatments. The 10-member committee, made up of members of parliament, also called for a national licensing body to monitor and regulate all such research, whether publicly or privately funded. And although the parliamentarians unanimously condemned the use of ES cells for reproductive cloning, they left open the door to the creation of embryos as a source of genetically matched ES cells—so-called therapeutic cloning—by calling for a 3-year moratorium on the practice. The Australian government is expected to seek legislation to implement the recommendations.

This stands in stark contrast to restrictive conditions imposed on U.S. researchers. On 9 August, President George W. Bush announced that federally funded scientists could obtain ES cells only from existing cell lines; shortly before, the U.S. House of Representatives passed a bill that would ban cloning for research purposes.

In Australia, Catholic commentators condemned the report for failing to ban outright the creation of embryos for research. But medical ethicists such as Helga Kuhse of the University of Melbourne and Monash University believe the committee should have gone further. "I can't see why scientists should be limited to surplus embryos" from fertility treatment, she says. "Embryos are hard to come by, and, to me,

ScienceScope

Court Asked to Reconsider Several academic groups are asking the Maryland Court of Appeals to reconsider part of a recent decision that they say could halt "virtually all" research involving children.

The 16 August ruling, which concerned a study of home lead cleanup by the Johns Hopkins University (JHU)–affiliated Kennedy Krieger Institute, says no child or legally impaired adult should be allowed to participate in "nontherapeutic" studies involving "any risk" (*Science*, 31 August, p. 1567 and 14 September, p. 1997). This sweeping wording "would have a devastating impact" on research by barring standard procedures such as needle sticks and the use of placebos, says an amicus brief filed by JHU, the Association of American Medical Colleges, the Association of American Universities, and the University of Maryland Medical System. The groups ask the court to rescind this portion of the decision. An AAMC spokesperson says the court has indicated it may hear the appeal in October.

West Nile Watch The West Nile virus keeps popping up in more U.S. states. In the last month, health authorities in Maine, Illinois, Wisconsin, Iowa, Kentucky, Alabama, and Tennessee reported detecting the agent in birds or other animals for the first time.

West Nile, which had never been found in the Americas until it hit New York City in 1999, has now been reported in 24 states and the District of Columbia, and "we need to assume that it's going to spread throughout the country," says Duane Gubler, head of the Centers for Disease Control and Prevention's arthropod-borne virus lab in Fort Collins, Colorado. Gubler suspects that migratory birds transported the virus to southern states such as Florida and Louisiana in the fall of 1999 or 2000; from there, it probably hitched a ride to the northern Midwest this spring.

So far, the human toll has been relatively low: Early this week, there were 26 reported or suspected cases, including one fatality, compared to 62 cases in 1999 and 18 last year. And even if it conquers the rest of the country, good surveillance, prevention, and control measures should prevent the virus from becoming a major public health threat, says Gubler: "This is a virus we can deal with."

the distinction between embryos created with somatic cells and those created from an egg and sperm is nontenable."

ES cell workers welcome the report, says Martin Pera of the Monash Institute of Reproduction and Development in Melbourne. Currently, scientists face a jumble of legislation that varies among state and territorial jurisdictions. For instance, Pera and his Monash colleagues derive ES cells in Singapore because it is illegal to do so in the state of Victoria. "This report finally provides a clear framework for Australian scientists," he notes.

In Israel, a national bioethics committee has approved both the derivation of ES cells and research into therapeutic cloning. The report, issued by the Bioethics Advisory Committee of the Israel Academy of Sciences and Humanities on 4 September, does not have the force of law, says committee member and molecular biologist Hermona Soreq of the Hebrew University of Jerusalem, but she expects the national science funding agency to follow its recommendations.

This report lends important formal support for Israel's existing policy, says Nissim Benvenisty, an ES cell researcher at Hebrew University. Joseph Itskovitz of the Rambam Medical Center in Haifa, for instance, has already derived several ES cell lines in Israel.

In 1999, the Israeli Knesset passed a 5-year moratorium on cloning procedures that lead to "the creation of a whole human being." However, the ethics committee wrote that the law "does not rule out producing cloned embryos that will not be implanted," giving the green light to therapeutic cloning. The full report will be published on the academy's Web site at www.academy.ac.il.

–LEIGH DAYTON AND GRETCHEN VOGEL

Leigh Dayton writes from Sydney, Australia.

CONDENSED MATTER

Quantum Condensate Gets a Fresh Squeeze

Cooled to a few billionths of a degree above absolute zero, atoms in a Bose-Einstein condensate (BEC) represent an extreme state of matter. But physicists at the Massachusetts Institute of Technology (MIT) have subjected the atoms in condensates to even more outrageous ordeals, squeezing them into one-dimensional lines and two-dimensional planes. The experiments, reported in the 24 September issue of *Physical Review Letters*, open the door to investigating a new regime of physics in which the rules are easier to understand.

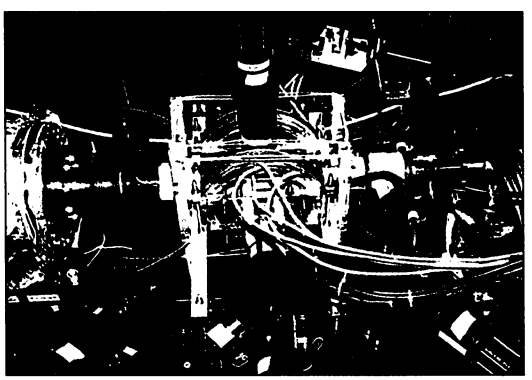
In a BEC, atoms lose their individuality. Cool a clump of matter enough, damping out the random thermal motions of the particles, and the atoms can merge, becoming, in a quantum-mechanical sense, a single coherent object. For the past 5 years, scientists around the world have been experimenting with the strange properties of these atomic ensembles, listening to them ring with sound waves, building atom "lasers" with them (*Science*, 13 February 1998, pp. 986 and 1005), and using them to slow light to a crawl.

But these experiments all probed three-dimensional BECs. One- and two-dimensional systems have "strikingly different physics," says MIT physicist and team member Wolfgang Ketterle. "Critters or creatures in a one-dimensional world can't pass by each other, for example," changing the behavior of the system as a whole, he says.

William Phillips, a Nobel laureate at the National Institute of Standards and Technology in Gaithersburg, Maryland, says lower dimensional BECs are exciting for their potential use in studying phenomena such as solitons—stable waves—within BECs. "In 3D, [solitons] can break up into vortices and phonons. There are instabilities because of these possibilities," he says. "In one dimension, there are fewer things that can happen," making the solitons more stable.

To make lower dimensional BECs, the MIT group started with ordinary 3D BECs made of sodium atoms. For the 1D BEC, the group simply trapped the condensate in strong magnetic fields and stretched it into a cigar shape. The extreme fields made it much easier for atoms in the condensate to flow along the cigar's long axis. As a result, atoms could move in only one dimension if shoved by an outside force. "If you bang it, it's going to respond axially; it's not going to respond radially," says physicist Randall Hulet of Rice University in Houston. (Similar results with lithium atoms were published last month by a French group.)

The 2D BEC took an extra step. Instead of staying in a magnetic trap the entire time, the atoms had to be transferred to an optical trap, where the condensate was confined by a sheet of light. The MIT team then watched as the condensates switched over from three dimensions to two or one dimension.



Torture chamber. The BEC II device at MIT crushes an extreme form of matter into lower dimensions.

CREDIT: W. KETTERLE/MIT

Hulet and Phillips agree that Ketterle's results are only a beginning. Researchers would learn more by watching condensates form in lower dimensions, they say, instead of squeezing a 3D cloud into the required shape. Nonetheless, "it's a first step to being able to do interesting physics in a new regime," Hulet says. Torturing a few sodium atoms is a small price to pay for such an opportunity.

–CHARLES SEIFE

PALEOANTHROPOLOGY

Tools Show Humans Reached Asia Early

If Africa was the cradle of humanity, then Asia was the crossroads of early human migrations. Asia was the first continent that early humans explored on their exodus from Africa and was the jumping-off point for later treks to the New World, Australia, and perhaps Europe. But exactly when early humans first reached Asia has long mystified paleoanthropologists. The first signs of their presence are *Homo erectus* fossils dated to between 1.7 million and 1.9 million years ago in Dmanisi, Georgia, on Asia's western edge, and in Java, Southeast Asia (*Science*, 12 May 2000, p. 948). But there are still questions about some of those dates, and other traces of ancient Asians are questionable until about 1 million years ago.

Now, in this week's issue of *Nature*, the case for an early movement out of Africa is further boosted by new work dating Chinese stone tools to 1.36 million years ago. What's more, the tools were found in relatively cold northern China, by an ancient lake bed 150 kilometers west of Beijing. To reach that spot, early humans must have migrated long distances over difficult terrain, armed only with simple tool kits.

The new report is notable for its "very nice, clean" dating methods on pieces of stone that are indisputable tools rather than natural flakes, says geologist Frank Brown of the University of Utah in Salt Lake City. It also documents "the earliest known penetration of the northern latitudes by early *Homo* in Asia," says paleoanthropologist Russell Ciochon of the University of Iowa in Iowa City. "This demonstrates that *H. erectus* was able to adapt to more seasonal and challenging environments than previously considered."

The stone tools—simple flakes, cores, and scrapers—were found 21 years ago by Chinese geologists in the hilly badlands of the Nihewan Basin, at the northeastern margin of the dust-blown Loess Plateau. Researchers had suspected that artifacts at a half-dozen sites in the basin were more than