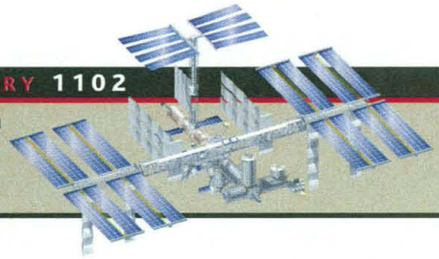


field telescope called LAMOST (Large Area Multi-Object Spectroscopy Telescope) is currently under construction at Xinglong station (*Science*, 8 November 1996, p. 915), while a space solar telescope and a 500-meter-wide radio telescope called FAST are still under development (*Science*, 7 August 1998, p. 771). CAS is also moving ahead with plans for a new optical telescope, in the 3- to 4-meter range, for the Yunnan Observatory. It would replace a 1-meter telescope near Kunming whose capability has been degraded by light pollution. NAOC's arrival on the scene should help cut through red tape on domestic projects, says Wang, as well as offering one-stop shopping to potential collaborators from abroad.

That streamlined management is also expected to foster partnerships with Chinese universities that operate strong programs in basic astronomical research. Three subcenters will be created in Beijing University, Nanjing University, and the China Science and Technology University in Hefei, with money mainly coming from the center.

If all goes smoothly, NAOC will evolve into the National Astronomical Observatory by the end of 2000 and the separate facilities will lose their individual identities. The triple attraction of new telescopes, more money, and an improved working environment is expected to bolster Chinese astronomy in the coming decade, says Wang. "It is impossible to make conditions as comfortable as our foreign counterparts," he says, "but we will try our best." **–LI HUI**

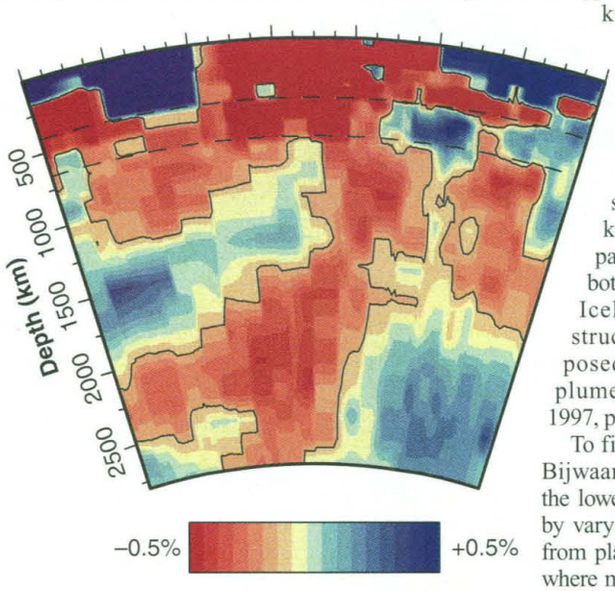
Li Hui writes for *China Features* in Beijing.

MANTLE DYNAMICS

Iceland's Fires Tap the Heart of the Planet

On Earth, what goes up must come down. But inside the planet, just how things work hasn't been so obvious. Researchers probing Earth's interior have traced great sheets of rock—former sea floor—plunging deep into Earth's mantle, hard against the molten iron core (*Science*, 31 January 1997, p. 613). But do such slabs—or any other rock from these great depths—ever come up again? Many researchers have thought that mantle plumes—narrow columns of rising hot rock that feed volcanoes at hot spots like Hawaii and Iceland—tap the deep mantle, but they had no hard evidence, and others argued that plumes have shallower roots. Now, with a sharper view of the lower mantle, a pair of seismologists is extending Iceland's plume to the very base of the mantle, 2900 kilometers down.

By using new tricks to process earthquake waves into a seismic image, seismologists Harmen Bijwaard and Wim Spakman of Utrecht University in the Netherlands have produced an image of a plume rising from near the bottom of the mantle all the way up to Iceland's surface, as they report in a recent issue of *Earth and Planetary Science Letters*. "It's really cool—you can see the plume going down," says seismologist Richard Allen of Princeton University. "I would now say there's good evidence—although not yet proof—that the Iceland plume originates from the core-mantle boundary."



A long way up. In this vertical cross section of the mantle beneath Iceland, a column of seismically slow and therefore hot rock (red) rises from near the core to the surface.

Seismologists have tried to map the plume by combining the travel times of waves passing under Iceland from distant earthquakes to form a kind of CT (computerized tomography) scan. Hot rock slows seismic waves, so researchers could check such images for a hot, seismically slow column of rock. But with conventional methods, the limited seismic data give such fuzzy views of the mantle that a complete plume can't be recognized, although researchers have found parts of it.

Using seismic waves recorded on Iceland itself, for example, seismologist Cicely Wolfe of the Woods Hole Oceanographic Institution (WHOI) in Massachusetts and her colleagues imaged a 350-kilometer-wide plume extending to 400 kilometers beneath the island; Allen recently narrowed the width of that plume to 200 kilometers. Two years ago, Yang Shen of WHOI and his colleagues showed that at greater depths, something hot and narrow beneath Iceland is apparently raising the traditional 660-kilometer boundary between upper and lower mantle by 20 kilometers (*Science*, 6 February 1998, p. 806). And last fall Donald Helmberger and his colleagues at the California Institute of Technology in Pasadena seismically detected a 250-kilometer-wide dome of partially molten rock at the bottom of the mantle beneath Iceland—just the kind of structure that has been proposed as a likely source for plumes (*Science*, 31 January 1997, p. 614).

To fill in the rest of the picture, Bijwaard and Spakman brought the lower mantle into better focus by varying the image's resolution from place to place, sharpening it where many wave paths happen to pierce a particular spot, rather than using a uniform but lower resolution, as is typically done. The pair also calculated the 7.6 million seismic wave paths individually rather than averaging many wave paths together, as is often done to save computing time.

The end result is what they call "the first rather detailed image of a whole mantle plume." The pictured plume is no textbook example—it's still as much as 500 kilometers wide versus the expected couple of hundred kilometers, twisted a bit, and even seems to branch at one point. And because few seismic waves passed through the top and very bottom of the mantle, the image is not very reliable there. But "for most of the lower mantle," says Bijwaard, "vertical resolution is very good, implying the continuous structure seen there probably really is continuous." Allen agrees, and Rob van der Hilst of the Massachusetts Institute of Technology—whose own global images from the same raw data hadn't shown a distinct plume—also accepts that the new work "is indeed evidence for a continuous plume" in the lower mantle.

If Iceland does build itself with rock from

CREDIT: BIJWAARD AND SPAKMAN/EPSL

the very heart of the planet, as now seems likely, then the circle will be closed: Earth's surface not only sinks into the depths but deep rock feeds the surface, offering scientists another window into the planet's deepest depths.

–RICHARD A. KERR

TRANSGENIC ANIMALS

Fertility Therapy May Aid Gene Transfer

The premillennium frenzy about cloned drug-secreting sheep and cows, or pigs that have been given human genes in hopes of using them as organ donors, tends to gloss over the fact that introducing foreign genes into animals other than mice is still very difficult. Because current techniques—which primarily involve injecting DNA directly into fertilized eggs—have only a modest success rate, costs can soar to more than $300,000 for a single cow carrying a foreign gene. Now, genome tinkers may have a new tool for beefing up animal genomes with exotic DNA: sperm.

On page 1180, embryologists Anthony Perry, Teruhiko Wakayama, and Ryuzo Yanagimachi of the University of Hawaii School of Medicine in Honolulu and their colleagues report that they have used sperm to transfer a foreign gene into mice. The technique is a modification of a method originally developed by Yanagimachi for injecting sperm into eggs that is now standard for in vitro fertilization of human eggs. About 20% of the mouse pups born in the group's experiments carried the transgene—which is "definitely on the high side of what's done routinely," says George Seidel, a reproductive physiologist at Colorado State University in Fort Collins. Adds embryo physiologist Gary Anderson of the University of California, Davis, "If this works in other species, people will jump on it like a banshee."

For some this is a giant "if," however. Reproductive biologist James Robl of the University of Massachusetts, Amherst, describes the technique as "very interesting." But he adds, "I'm not sure how widespread its applicability will be." He and others note that before the mouse work, the sperm injection method, known as ICSI for intracytoplasmic sperm injection, had been shown to work well only in humans.

Researchers have been trying to use sperm to create transgenic animals for about 10 years. In early experiments, they simply mixed the DNA to be transferred with sperm and used the mixture for in vitro fertilization. Although the technique initially appeared to work, Anderson says, "even leading people in the field haven't been able to repeat the original result." Today, there seems to be general agreement that such sperm-mediated gene transfer succeeds, but with highly variable efficiency.

About 2 years ago, Perry decided to take a quick shot at seeing whether Yanagimachi's ICSI method would do better. The researchers first removed the propellant tails from sperm and subjected the sperm heads to freezing or detergents to disrupt their cell membrane. They then mixed the sperm heads with a gene encoding green fluorescent protein (GFP). To inject this mixture, the team used a so-called piezoelectric device, which drives the tiny injection pipette very fast and precisely into mouse eggs.

Compared to the manual injection devices used in human fertility clinics, piezoinjection seems to be far less disruptive for the egg. "The mouse egg is the most fragile of [all species]. This study would have been impossible without the piezodevice," says Robert Wall, a geneticist at the U.S. Department of Agriculture's Agricultural Research Service in Beltsville, Maryland.

When the researchers injected the GFP gene along with untreated sperm, only 26% of the embryos carried the transgene. But it was present in up to 87% of the early embryos produced by the detergent-treated or frozen sperm—as indicated by the embryos glowing green under an ultraviolet lamp. Ultimately, however, only about 20% of the newborn pups that developed from the injected eggs carried the GFP gene. Perry suspects that GFP has a deleterious effect on embryonic development, so the transgenic fetuses tend to be selectively aborted. Whatever happens, a majority of the animals that end up with the transgene trans-

Greening up. These mouse embryos glow green under ultraviolet light *(right)* because they acquired the gene for green fluorcescent protein along with injected sperm.

CREDITS: PERRY *ET AL.*

ScienceScope

Clinical Clampdown A member of the U.S. biomedical elite—Duke University's Medical Center in Durham, North Carolina—was ordered to freeze most of its clinical research this week. Duke University stopped enrolling new patients in government-sponsored studies after receiving an order to halt from the Office for Protection from Research Risks (OPRR), which is part of the Department of Health and Human Services.

OPRR officials could not be reached for comment, but Duke disclosed in a statement on 11 May that OPRR has been asking the university since December to bring its procedures into line with OPRR rules. Among other things, OPRR has asked Duke to keep more extensive records and create a second review panel to monitor a growing number of clinical trials. Duke offered some changes in March and April. But OPRR, displeased with "the scope and pace of [Duke's] implementation of corrective actions," suspended patient enrollment in government-sponsored trials on 10 May.

Duke's chancellor for health affairs, Ralph Snyderman, says "hundreds" of studies will be disrupted. University officials "absolutely were not" prepared for OPRR's order, he says, adding that it "would be an understatement" to say it took them by surprise. "From our perspective," Snyderman says, "I don't believe any patient was put at risk," but he is satisfying OPRR's requirements and hopes to get clinical research on track in a week.

Pulling Up Their Genes France's genome research may soon get a big boost. The government is considering plans to pump an additional $330 million over the next 3 years into a gene research complex in the Paris suburb of Evry, according to a report this week in *Le Monde*.

The extra spending is reportedly driven by worries that the French genome program is being left behind by major investments in gene research in the United States and the United Kingdom. Officials hope that by following suit, France will get its share of potentially lucrative genome patents.

Officials at Génopôle—which includes the national gene sequencing center and several corporate labs—were not available for comment as *Science* went to press.