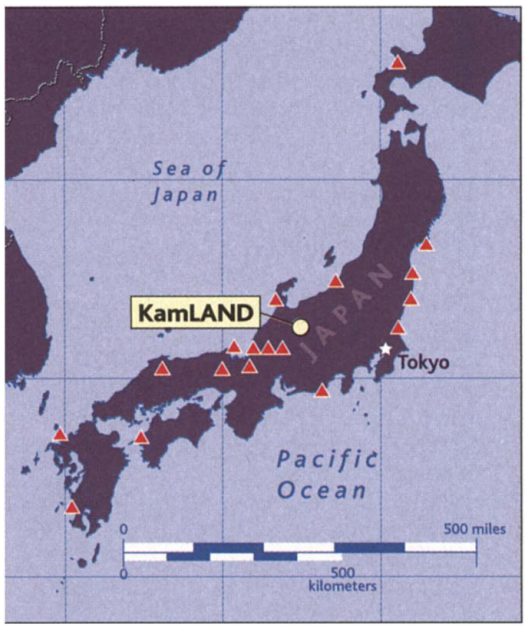
of the particle, you get a consistent result," says John Learned, a KamLAND collaborator at the University of Hawaii, Manoa.

"This is what everyone expected, but nature could have fooled us," says Bahcall. If neutrinos and antineutrinos behaved differently, they would violate an important principle in particle physics known as CPT symmetry. Physicists have tested the principle in the sector of physics that has to do with the strong force (and quarks and gluons), but KamLAND's result is the first to verify it with any degree of accuracy in the realm of the weak force (and neutrinos).

Furthermore, because the antineutrinos are created in nuclear reactors rather than in the core of the sun, physicists needn't worry that incorrect assumptions about the sun's inner workings might mess up their calculations. "There was a possibility that [the sun's] magnetic fields were flipping the spins of the neutrinos," says Learned. "The caveats about solar neutrino measurements are all eliminated in one grand stroke."



Ground truth. The subterranean Kamioka Liquid Scintillator Antineutrino Detector spots particles from Japanese reactors (triangles).

SOURCE: INTERNATIONAL NUCLEAR SAFETY CENTER AT ANL (OCTOBER 2002)

With more data and a refined understanding of the detector's properties, KamLAND scientists should be able to pin down the difference in mass between two species of neutrinos, says Giorgio Gratta, a KamLAND team member at Stanford University. That's one of the key parameters that dictate their properties. But even the first results are narrowing the possible range of the mass difference, Gratta says: "I'm very happy."

The KamLAND team hopes eventually to spot neutrinos coming from deep inside Earth. They are the product of the decay of radioactive elements that keep the planet's center so hot. The number of neutrinos from these nuclear reactions will give geologists a direct measure of the amount of radioactive material buried in the heart of the planet.

–CHARLES SEIFE

GENETIC MODIFICATION

Europe Prepares for Arrival of GM Foods

BRUSSELS—The European Union (E.U.) appears set to lift its 4-year ban on foods made from genetically modified organisms (GMOs), following the drafting of a new directive on food labeling late last month. The European Parliament is expected to give its final approval of the new rules next March, and the European Commission last week put in place the mechanism to make the new system work: the European Network of GMO Laboratories (ENGL).

The new rules will require a GMO label on any food containing more than 0.9% GMO material, a threshold designed to allow for some accidental contamination. "These are among the tightest regulations [on GMOs] in the world," says Barry Mc Sweeney, director-general of the commission's Joint Research Centre (JRC). JRC's main laboratory in Ispra, Italy, will coordinate the ENGL network of more than 45 institutes in the 15 E.U. member states and 10 countries that are expected to join in 2004. These labs will randomly test foodstuffs to ensure that they are GMO-free if they claim to be, or that they contain only approved GMO materials. "We need harmonized procedures and methods to ensure that we get the same results" all over Europe, says Guy van den Eede, coordinator of ENGL.

In the future, any food or feed company that wishes to market a new GMO will have to submit reference material and a specific testing method to the Ispra ENGL lab. ENGL will validate the test and, if approved, it will be registered as an international standard. All the ENGL labs will then use the test in their countries.

The idea behind the new legislation is to allow consumers to choose GMO-free food if they wish, while allowing biotech companies to market their wares. Although most environmental organizations welcome the strict regulations, one proposal drew fierce opposition. For a 3-year period, the commission wants to allow foods containing 0.5% of "GMO material unauthorized in the E.U., but which has undergone a favorable risk assessment." Peter Riley of Friends of the Earth in the U.K. says unlicensed GMOs should be completely banned: "If the U.S. is growing crops that are not accepted worldwide, it is their problem."

But E.U. Research Commissioner Philippe Busquin says the network "provides

ScienceScope

GM Corn OK Ending years of controversy, the Philippines has become the first Asian nation to approve the sale of genetically modified (GM) corn seed. The government's agriculture department last week gave Monsanto permission to market a strain modified to resist corn borers, a common pest. Monsanto's corn is the first major GM food crop to gain approval in Asia.

Size Counts NASA Administrator Sean O'Keefe says the international space station's crew is likely to grow after 2006. The prediction, made last week at a Tokyo meeting, was a relief to many scientists, who say that little meaningful research can be done with the current crew of three. O'Keefe told project partners that the Bush Administration's 2004 budget proposal, due in February, would include "the appropriate financing" to allow station science to expand by 2007 —a goal embraced by Europe, Japan, Canada, and Russia.

New Stem Cell Law Australia's Parliament this week approved national stem cell legislation that will harmonize a jumble of state and territorial rules. Under the new law, which was the subject of extensive debate (*Science*, 6 September, p. 1627), researchers will be able to use existing human embryonic stem cell lines and create new lines from excess embryos created for in vitro fertilization prior to 5 April 2002. Biologist Martin Pera of Monash University says the rules will allow research "to go forward on a sound ethical basis."

NIH Litmus Test? Concerns that the Bush Administration is blackballing ideologically incompatible science advice (*Science*, 15 November, p. 1323) now extend to the National Institutes of Health's (NIH's) advisory councils. In a 21 November letter to Department of Health and Human Services Secretary Tommy Thompson, Representative Edward Markey (D–MA) and three other lawmakers ask why one nominee to a National Institute on Drug Abuse panel was questioned about his voting preferences and his views on needle exchange, abortion, and drug legalization. The nominee, psychologist William Miller of the University of New Mexico, Albuquerque, says he was apparently rejected last January after giving incorrect answers. In this case and others, the lawmakers want to know "why ... this information is relevant" to providing scientific advice.

us with an important tool to ensure that we harvest the potential that biotechnology holds for consumers in a responsible way."

–PHILIPP WEIS

CLIMATE

River Flow Could Derail Crucial Ocean Current

Some of the biggest rivers in the world are dumping 7% more water into the Arctic Ocean than they were in the 1930s—an increase of 128 cubic kilometers per year. The finding, reported on page 2171, fits well with climate-model predictions that precipitation at high latitudes will increase as global temperature climbs. If the warming trend continues, the influx of fresh water could have a major impact on ocean circulation and northern climate. But many experts caution that too little is known to make any solid predictions about such effects. "I would call this intriguingly important," says Bert Semtner, an oceanographer at the Naval Postgraduate School in Monterey, California.

Freshening up. Large Eurasian rivers such as the Yenisey are pouring more fresh water into the Arctic Ocean.

To get the results, ecosystem scientist Bruce Peterson and colleagues at the Marine Biological Laboratory in Woods Hole, Massachusetts, teamed with hydrologists from the University of New Hampshire, Durham, and the State Hydrological Institute in St. Petersburg, Russia, to analyze discharge records for six major Eurasian rivers. The records spanned 64 years, about twice as long as comparable records for major Arctic rivers in North America. Figures for each river varied widely from year to year but, on average, the total annual runoff increased by 2 cubic kilometers each year.

Global warming is likely to be causing the increase, climatologists say. Higher temperatures mean more evaporation, especially in the subtropics. Warmer air can hold more moisture, which then precipitates as air masses move to high latitudes, leading to an increase in river discharge. "There is no other measure of change in [the] Arctic freshwater budget that's as accurate and comprehensive," Peterson says.

The researchers estimate that for each degree of global warming, these six Eurasian rivers would pour an extra 212 km^3 per year into the Arctic Ocean. If global temperature rises by 5.8 degrees Celsius by 2100—the upper end of estimates from the Intergovernmental Panel on Climate Change's (IPCC's) 2001 report*—the rivers might increase freshwater flow to the Arctic Ocean by 1260 km^3 per year.

"It's a worrying number," says co-author Stefan Rahmstorf, a climatologist at the Potsdam Institute for Climate Impact Research in Germany. Increasing river runoff, he explains, might put the brakes on an important current in the North Atlantic called the thermohaline circulation (THC). Under present conditions, cold, salty surface waters sink to great depths and then move south, while warmer water on the surface moves northward. Any freshening of the surface waters in the North Atlantic would reduce the seawater density and slow the THC.

Climate models by Rahmstorf and colleagues at Princeton University suggest that the IPCC's worst-case warming scenario would put discharge in the ballpark of the amount needed to bring the THC to a halt. Contributions from other Arctic rivers, precipitation onto the Arctic Ocean, and melting ice (such as that on the Greenland ice cap) could push the THC across the threshold. That would put a damper on warming near the North Atlantic, Rahmstorf says. THC shutdowns have had severe consequences in the past, he points out: 11,000 years ago, a sudden, massive pulse of freshwater into the North Atlantic chilled Europe. "It's not just an odd thing that happens in models," Rahmstorf says.

Much remains to be learned. "I would be very careful about anything more than very loose speculation on the influence of the runoff and changes in the overturning of the North Atlantic," says Knut Aagaard, an oceanographer at the University of Washington, Seattle. Some researchers, for example, question how much influence additional discharge could have on the THC. Semtner says that factors such as direct warming of the ocean surface might have more sway in weakening the THC. That's one question that may be clarified by researchers participating in the Coupled Model Intercomparison Project. They are now running six major climate models, all including a major pulse of freshwater from the Arctic Ocean. Results are expected to be released next spring. –ERIK STOKSTAD

* IPCC, *Third Assessment Report—Climate Change 2001.*

FISHERIES SCIENCE

Report Seeks Answers To Marine Mystery

A sleek sea lion with a hefty appetite for fish could become the centerpiece of a massive ecological experiment. A panel of the National Academies* last week recommended that the U.S. government run a decade-long test off Alaska to determine whether commercial fishing is a threat to Alaska's dwindling Steller sea lion population. The advice, requested by Congress, could help settle a high-stakes dispute over catch restrictions in one of the world's most valuable fisheries.

"You need to do something at this [large] scale if you want to understand what's driving the [population] decline," says panel member Larry Crowder, a fisheries biologist at Duke University in Durham, North Carolina. "But it's not an easy thing to pull off."

Steller sea lions once dotted North Pacific shores from California to Japan, with an estimated 70% living in Alaskan waters. Over the last 30 years, however, Alaskan populations have plummeted by 80%, to fewer than 70,000 animals. Scientists have long debated the cause. Whereas some blame fishing boats for taking too much of the mammals' prey, others finger climate change, predators, disease, or poaching.

* *The Decline of the Steller Sea Lion in Alaskan Waters*, National Research Council, 2002 (www.nap.edu/catalog/10576.html).

Barking for answers. Researchers want to test whether fishing threatens Steller sea lions.

CREDITS: (TOP TO BOTTOM) ROBERT MAX HOLMES/MARINE BIOLOGICAL LABORATORY; KENNAN WARD/CORBIS