rise. The iridium showed up around the globe sandwiched between Cretaceous rock and Tertiary rock, often accompanied by mineral bits bearing scars from the shock of impact. And these traces of impact always fell at the moment of extinction, a time pinned down with increasing precision as paleontologists built more detailed fossil records.

Many paleontologists began to think that before long, every mass extinction would have its impact. No such luck. Not a single other extinction has been firmly linked to an impact, although there have been hints. In the early 1990s, palynologist Sarah Fowell of the University of Alaska, Fairbanks, and Olsen found a rock layer rich in the spores of ferns—plants that rush in when the landscape is devastated—in southeastern Pennsylvania. These fern fossils appear in rocks formed at the Triassic-Jurassic (T-J) boundary 200 million years ago. (A similar fern spike marks the K-T boundary in western North America.) And geologist David Bice of Carleton College in Northfield, Minnesota, found what he suggested were impact-shocked quartz grains near a marine T-J boundary in Italy (*Science*, 11 January 1991, p. 161).

But the Pennsylvania fern spike and the unimpressive Italian shocked quartz never won anyone over, so Olsen and colleagues checked the fern spike for iridium and hit pay dirt. As they report in their paper, three sites in Pennsylvania show elevated iridium across the same 40 centimeters of rock containing the pollen spike. Peak iridium comes at the base of a 5-centimeter coal layer sitting on top of a layer of claystone, much as K-T rock looks in western North America. But at a maximum of 285 parts per trillion, the T-J iridium is not far above a background of 50 parts per trillion and is only one-third the size of the lowest concentrations found at the K-T. That small an amount of iridium might have been concentrated by natural geochemical processes or perhaps even carried in from volcanic eruptions; one of the largest outpourings of lava in Earth's history began nearby no more than 20,000 years after the boundary and has itself been suggested as a trigger for the T-J events (*Science*, 18 August 2000, p. 1130).

What was happening to the dinosaurs during the iridium-dusted fern spike? To find out, Olsen and his colleagues—especially amateur paleontologists Michael Szajna and Brian Hartline of Reading, Pennsylvania—collected footprints left in the mud of the string of lakes that ran through the middle of what was then the supercontinent Pangea. Lumping together more than 10,000 tracks found in former lake basins from Virginia to Nova Scotia, they found that "the nondinosaurs were getting wiped out" across the boundary, says Olsen; dinosaurs jumped from 20% to more than 50% of taxa. At the same time, meat-eating dinosaurs ballooned to twice their previous mass, to judge by the size of their tracks—much as mammals grew larger after the K-T.

In the Newark basin lake sediments in New York and Pennsylvania, the group found that tracks of Triassic reptiles that had been around for 20 million years disappeared within 20,000 years of the spore-iridium event. Then the first distinctive tracks of dinosaurs that would dominate the Jurassic appeared within 10,000 years after the event. Given the high statistical unlikelihood of ever finding the last Triassic track or the first Jurassic track, that places all four events—the disappearance of Triassic reptiles, the ascendancy of the dinosaurs, an apparent disaster among plants, and a hint of an impact—in the same geologic instant.

Paleontologists like what Olsen and his colleagues did with their huge footprint database. "They've definitely pinned [the evolutionary transition] right on the boundary," says paleontologist Michael Benton of the University of Bristol, U.K., thanks to their use of clocklike climate cycles recorded in the lake basins. Impact specialists are less impressed. The iridium by itself is unimposing, says cosmochemist David Kring of the University of Arizona in Tucson. Finding clear-cut shocked quartz would be convincing, he notes, but analyses for other, iridiumlike elements could show that the iridium is truly extraterrestrial. Then the dinosaurs could feel ambivalent about visitors from outer space. **–RICHARD A. KERR**

DRUG RESEARCH

Novartis Sows Its Future in U.S. Soil

CAMBRIDGE, MASSACHUSETTS—It was no mere political braggadocio when U.S. Senator Edward Kennedy (D–MA) last week called Cambridge's Kendall Square the "epicenter of the biotech world." The Swiss drug giant Novartis, based in Basel, intends to set up a $250 million research facility here that will guide its overall R&D efforts—a move that has sent shock waves rippling through the company's home turf.

Novartis's move is the latest blow to homegrown European drug research and reflects the company's efforts to keep U.S. competitors in its sights. "Europe created its own problems by failing to ... ensure a dynamic research environment," explains Novartis Chief Executive Officer Daniel Vasella. The new center—the Novartis Institute for Biomedical Research Inc.—will coordinate the company's $2.4-billion-a-year R&D portfolio in the United States, Japan, and Europe.

The lab, slated to open early next year, initially will house 400 scientists—eventually staffing up to 1000—and will specialize in developing drugs against diabetes, cardiovascular ailments, and viral diseases. Its market is increasingly centered on this side of the Atlantic: Less than one-third of Novartis's sales are in Europe, while 43% is in the United States.

However, it was the talent pool as well as drug sales that convinced Novartis to establish its research hub in the United States. After considering both Southern California and the San Francisco Bay area, Vasella chose Cambridge with its winning combination of academic institutions such as the Massachusetts Institute of Technology (MIT) and Harvard University and its boatload of biotech businesses crowding an area once known for candy factories.

Interweaving. Novartis will set up its new center in this MIT-owned building.

Novartis was drawn to Cambridge's "interwoven environment," as Vasella calls it, where the traditional lines between industry and academia are becoming ever more blurred. The company persuaded Mark Fishman to leave academia—Harvard Medical School—to head the new center. The reluctant cardiovascular researcher turned down the job twice before Vasella overcame his skepticism about jumping to industry. "It was a very long and difficult sell," says Vasella. The blurring was also apparent in the setting of Vasella's announcement: the home of MIT president Chuck Vest. MIT will be Novartis's landlord, and talks likely will get under way this summer on a potential collaboration between the two powerhouses, Vest told *Science*. The company already has a decade-long collaboration with Harvard's Dana-Farber Cancer Institute that has been key to the development of the new cancer drug Gleevec.

Novartis hopes to avoid a reprise of the controversy surrounding its $25 million investment in plant research at the University of California, Berkeley, in 1998, which sparked widespread concern among academics about industry influence over the direction of university research. But that conflict pales in comparison with the general resistance in Europe to links between industry and academia. And European governments have failed to match the prodigious investments in biology and biotechnology made by both the U.S. government and venture capitalists, Vasella says: "The U.S. has pursued a much smarter policy."

CREDIT: RUDER FINN PUBLIC RELATIONS/NOVARTIS

Such statements may sting the home crowd, but they aren't being disputed. Members of the Swiss scientific community agree that their research programs are underfunded and offer few incentives to retain young talent. Last November, the Swiss Science and Technology Council launched a petition imploring the government to boost the research budget by 10% within 5 years. "The Novartis move is a very serious symptom of the downhill course of research in Switzerland," says Catherine Nissen-Druey, the advisory body's vice president. "It sends a message to young Swiss scientists that research is more promising in the U.S.A. than it is here." Nor is the Novartis move the first symptom of an ailing research community: Last summer, Switzerland's other drug giant, Roche, shuttered its once-vaunted Institute of Immunology in Basel (*Science*, 13 July 2001, p. 238).

Novartis hasn't turned its back on Switzerland entirely: Vasella says that all of the company's 1400 researchers in Basel will keep their jobs. It will also maintain its labs in the United Kingdom and Austria. But there's no getting around the fact that the European contingent will now be looking west for their marching orders. **–ANDREW LAWLER**

With reporting by Helena Bachmann in Geneva.

NEUROSCIENCE

Big Bucks for MIT Brain Center

CAMBRIDGE, MASSACHUSETTS—Just across the street from Novartis's new center (see previous story), another impressive research facility will break ground this fall, a $150 million academic complex devoted to neuroscience. That effort got a big boost last week, when the Massachusetts Institute of Technology (MIT) received $50 million—its largest contribution in history from a foundation—to jump-start one part of the complex: a learning and memory center led by Nobel laureate and biologist Susumu Tonegawa.

The money will pay for the new facility, additional faculty members, and an endowment for Tonegawa's center. But the gift won't clarify the fuzzy boundaries among the different pieces of MIT's neuroscience effort, which also includes a new institute led by fellow Nobel laureate and biologist Phillip Sharp, MIT's existing brain and cognitive sciences department, and an imaging institute. MIT officials say they are intentionally leaving the lines of responsibility blurred, and that the new neuroscience complex will allow the different groups to interact closely.

"MIT is taking a comprehensive approach to the study of the brain," says Robert Silbey, MIT science dean. And MIT president Charles Vest acknowledges "some conceptual overlap," saying it reflects not only the difficulty in drawing boundaries in an interdisciplinary field but also "some conceptual separation." At a 9 May press conference announcing the gift from the Picower Foundation based in West Palm Beach, Florida, Vest said that Tonegawa's piece of the brain pie will cover research from fundamental molecular neurobiology to systems neuroscience, whereas Sharp's institute will focus on systems, imaging, and computational neuroscience.

Sharp's institute, which has been slow to set a research agenda (*Science*, 24 August 2001, p. 1418), held its first major meeting this week with a heavy emphasis on molecular biology; many papers were devoted to neural stem cells and genetic neuroscience as well as imaging. Sharp doesn't see a boundary problem between his group, the imaging institute, or that of Tonegawa. "It's healthy overlap," he asserts.

The Picower gift to Tonegawa's center, which will be renamed the Picower Center for Learning and Memory, will disburse $10 million a year over 5 years, giving new clout and personnel to Tonegawa's efforts to understand the molecular basis for learning and memory. Thirty million dollars of the gift will go toward the complex, $12 million will be allocated to four new faculty positions, and the remaining $8 million will be used to establish an endowment.

This amount is far smaller than the $350 million pledged to Sharp's McGovern Institute for Brain Research. But that pledge provides only $5 million a year for the first 20 years, half of what Tonegawa will receive in the first 5 years. The complex will be ready in 2004 or 2005.

–ANDREW LAWLER

Better mousetrap. Barbara Picower, left, Jeffry Picower, center, and Norman Leventhal, MIT class of 1938, examine an experiment designed to test mouse memory at Tonegawa's institute.

CREDITS: (TOP TO BOTTOM) JEFF MILLER/UNIVERSITY OF WISCONSIN, MADISON; DONNA COVENEY/MIT

ScienceScope

Patented Cells An ethics advisory group last week recommended that the European Commission (EC) oppose patenting embryonic stem (ES) cell lines unless they have been modified for specific industrial applications. The European Group on Ethics' proposal, if adopted, would put the EC at odds with U.S. policy, which granted a patent covering both the technique the University of Wisconsin's James Thomson used to derive ES cell lines and any lines thus derived. Stem cell policies vary widely across Europe.

A spokesperson for the Wisconsin Alumni Research Foundation (WARF), which holds the patent on Thomson's derivation technique, says WARF is reviewing the panel's report but adds "the European Union seems to believe that [our ES cell lines] occur in nature. This is not the case."

The panel argues that unmodified lines derived from ES cells "are so close to the fetus or the embryo from which they have been isolated" that patenting them represents "commercialization of the human body." The panel also backed the use of "compulsory licenses" in situations where the public good required access and proposed a European Union registry of unmodified ES cell lines.

Innovation Plus Brazil is preparing legislation to strengthen ties between academic scientists and industry. Although both sectors support the idea, neither thinks the proposal will turn the country into a technological powerhouse.

The plan, drafted by the Ministry of Science and Technology, would allow universities for the first time to license discoveries to industry, give companies access to public research facilities, and provide greater protection for intellectual property. "We want to give universities greater flexibility," says the ministry's senior executive, Carlos Américo Pacheco.

Roberto Nicolsky, a physicist at the Federal University of Rio de Janeiro and head of a high-tech business coalition, would like the bill to go further and subsidize companies willing to take risks. And the president of the Brazilian Society for the Advancement of Science says the government's priorities are askew. "We must first strengthen our infrastructure of basic and applied research," says biochemist Glaci Zancan.

Pacheco agrees that reforms in basic science are needed. "But we cannot wait for them," he says. In the meantime, he says, the proposal is "a huge advance for public universities."