PALEONTOLOGY

Life's Diversity May Truly Have Leaped Since the Dinosaurs

To judge by the haul of fossil clams, snails, and sea urchins that paleontologists have retrieved from ancient sea-floor sediments around the world, life has only gotten more and more varied during the past quarter-billion years. But those same paleontologists have become increasingly concerned that their less-than-systematic search for trophy fossils may have misled them about life's inevitably rising diversity (*Science*, 25 May 2001, p. 1481).

On page 1133 of this issue of *Science*, a group of paleontologists largely lays those worries to rest. Simply cleaning up the existing fossil record, they report, eliminates their reservations about the reality of rising diversity, at least in the case of the doubling of diversity since the death of the dinosaurs. "I'm convinced this demonstrates there has been a major diversity increase in the" past 65 million years, says paleontologist Richard Bambach of Harvard University, who is not a member of the group. "It did happen." Now paleontologists can focus on what might have increased diversity lately and on fixing the more numerous problems of the older fossil record.

The potential problem with the younger fossil record has been the so-called Pull of the Recent. The thorough knowledge of animals in the Recent epoch of the last 10,000 years—essentially, living animals—can inflate the trend in diversity by improving the completeness of the younger fossil record far more than that of the older record. The vagaries of fossilization mean that there will always be a time difference between the last known fossil of a species and its actual demise. There can be a missing section in a species' fossil record even if the species is still living. In the case of the coelacanth—the "living fossil" discovered swimming deep off South Africa in 1938—the gap is 65 million years.

Of course, knowing that the coelacanth lives, paleontologists fill in that 65-million-year gap since its last fossil. Thus, the living animal can "pull" its kind forward in the history of life, which increases diversity in the gap between its last fossil and the Recent. But the ancient coelacanth notwithstanding, the Recent's reach back is limited; it is most likely to pull species forward over the younger part of the record, increasing diversity more there than earlier and thus producing an inflated rise in diversity.

The obvious test for the Pull of the Recent is to drop the Recent and its living animals from an analysis of diversity trends. But paleontologist David Jablonski of the University of Chicago and his colleagues decided that before they did such an analysis, they needed to correct some mismatches between the way paleontologists have been classifying fossils over the decades and the way biologists classify living animals today.

Taking the class Bivalvia with its oysters, clams, and mussels, Jablonski and colleagues updated the records of 958 genera of living marine bivalves. All the selected living genera had fossils in at least one 5-million-year interval of the record, either the latest 5-million-year interval or earlier ones. They found that many genera present today that had seemed to be missing from the fossil record of the past 5 million years and had been pulled forward by the Recent were actually there all along. Paleontologists and biologists had simply put many species in two different genera. Other species had been lumped into broadly defined genera by paleontologists working over many decades; Jablonski and colleagues moved them into ▶

CREDIT: C. HOUSE/THE NEOGENE MARINE BIOTA OF TROPICAL AMERICA PROJECT

No shell game. Modern naming of bivalves shows that living examples do not distort the fossil record.

ScienceScope

MIT Out of Media Lab Asia

NEW DELHI—A 2-year-old collaboration between the Indian government and the Massachusetts Institute of Technology (MIT) has collapsed. Both partners confirmed earlier this month that disagreements over management, money, and staffing scuttled Media Lab Asia, which aimed to deliver cutting-edge technologies to India's rural poor.

Indian Communications Minister Arun Shourie told *Science* that "MIT was shown the door in March" after the government concluded that the project wasn't attracting needed private funds and that the Cambridge, Massachusetts, school wasn't fully collaborating. MIT officials dispute that assessment, but project founder Nicholas Negroponte says, "It became clear that a management partnership was not possible." Indian officials, meanwhile, say that much of the lab's work—which they backed with a $12 million grant and involves about 70 researchers—will continue. **–PALLAVA BAGLA**

Global Health Brainstorm

Got a novel scientific idea for conquering disease in the developing world? Now's your chance to be heard. Grand Challenges in Global Health, launched this year by the Bill & Melinda Gates Foundation, is seeking ideas for a $200 million pot of research money.

The initiative, which also involves the National Institutes of Health (NIH) and the Foundation for the NIH, wants help in identifying 10 to 15 "grand challenges," or ways to knock down barriers to improving health (*Science*, 31 January, p. 641). The panel hopes to avoid obvious concepts, such as developing a malaria vaccine, in favor of those that are "especially underinvested," says former NIH Director Harold Varmus, who chairs the effort's scientific board. Ideas are due by 15 June (www.grandchallengesgh.org). **–JOCELYN KAISER**

Swiss Science Budget Boosted

BERN—In a surprise move, the Swiss Parliament's upper house last week voted to boost government science spending by 6% annually over the next 3 years, for an overall total of $13 billion. Cabinet ministers had recommended a 4% annual increase.

Researchers are "very happy" with the vote, says Ingrid Kissling-Näf, secretary-general of the Swiss Academy of Sciences. But she calls the raise "the bare minimum" needed to keep Swiss science competitive. It falls short of a 10% annual increase urged by the Swiss Science and Technology Council (*Science*, 7 June 2002, p. 1781). The next hurdle comes in June, when Parliament's lower house will vote on the science budget. **–MIN KU**

more modern, narrowly defined genera.

Rationalizing fossil classification had dramatic results. When they calculated the diversity trend from the updated record without the Recent, Jablonski and his colleagues found that the Pull of the Recent had been affecting just 5% of taxa. Because the Pull of the Recent operates on so few taxa, it can't be biasing diversity much at all. When the group applied the same approach to the 5-million-year interval just before the end of the dinosaurs, the "Pull of the Danian Stage" (the interval just after) affected more taxa, as might be expected, but still only 13%. "I think we've really cracked the problem," says Jablonski. "All we really did was vet the data. It's very reassuring." Given that the bivalves are representative of most of the marine fossil record in their ease of preservation, Jablonski believes that the steep rise in diversity the past 65 million years is real.

Paleontologist Michael Foote, a colleague of Jablonski's at Chicago, isn't so sure. "They found that the Pull of the Recent for bivalves is substantially less than had been thought," he says, but "the jury's still out on whether that says the record is OK" at other times and for other animals. Bambach, however, sides with Jablonski, as does paleontologist Douglas Erwin of the Smithsonian Institution's National Museum of Natural History in Washington, D.C. "This puts the Pull of the Recent to bed," he says. And other problems that plague the older record don't seem to apply here. "You have to believe the [past 65 million years of] diversity increase is probably real," he concludes.

What could have been driving such a jump in diversity remains unclear. Speculations are numerous. Nutrients washed off rising mountain ranges may have fueled an increase in biological productivity that drove diversification. Or the subdivision of the world as continents split, opening new oceans dammed off from the others, could have created new places for different fauna to appear. The growing chill of the past 100 million years would also have increased the number of climate niches between the poles and the tropics for different animals to live in. Whatever the driver or drivers were, most paleontologists now have more confidence that searching for them is worthwhile.

–RICHARD A. KERR

TOXICOLOGY

E.U. Shifts Endocrine Disrupter Research Into Overdrive

CAMBRIDGE, U.K.—The European Union is embarking on a massive new effort to pinpoint the harmful effects of hormone-mimicking chemicals. Last month, the European Commission launched a collaboration involving 60 labs across the continent to investigate the threat that these substances, primarily pollutants, pose to humans and wildlife. The intent is both to give the E.U. the information it needs to ensure that chemicals are tested adequately for endocrine effects before reaching the market and to flag effects in compounds already out there.

Concern over so-called endocrine disrupters arose in the early 1990s, when studies tentatively linked rising levels of pollutants to declining sperm counts and cancer of the testicles, prostate, and breast in people and to genital malformations in wildlife. However, many of the studies have been controversial. Establishing a cause-and-effect relationship has been a "hot potato, politically and scientifically," says toxicologist Andreas Kortenkamp of the University of London School of Pharmacy, who coordinates the E.U.'s new Cluster of Research on Endocrine Disruption in Europe (CREDO).

The 4-year-long, $23 million program is meant to complement a substantial amount of research already under way around the world. For instance, many labs are probing the effects of chemicals that mimic or block estrogens, female sex hormones. One thrust of CREDO will be to look hard at compounds that block or behave like androgens such as testosterone, the main male sex hormone. Thus CREDO will "act as a counterbalance" to the stack of findings on estrogen disrupters, says Ulrike Schulte-Oehlmann, an ecotoxicologist at the University of Frankfurt, Germany. Her 13-lab consortium hopes to zero in on invertebrates, perhaps sea urchins or snails, that might serve as "sentries" in polluted environments and as standard test systems for detecting potential effects in higher species.

CREDIT: U. SCHULTE-OEHLMANN

Endocrine canary. Snails may serve as sentries for ill effects in people.

Another gap in understanding that CREDO will try to fill is the risk posed by bromine-containing flame retardants, used widely in polymers and textiles. These high-production chemicals, some of which bear striking toxicological similarities to known endocrine disrupters such as polychlorinated biphenyls, have been accumulating in aquatic food chains for decades. "This is a warning: We should be concerned about them," says toxicologist Joseph Vos of the National Institute of Public Health and the Environment in Bilthoven, the Netherlands, who is coordinating this part of CREDO.

The E.U. initiative will enter one controversial area: how hormone-mimicking chemicals interact with each other. Gauging the risks of individual chemicals in the milieu encountered in nature is "a nightmare scenario" for risk assessors, says Kortenkamp. Much work needs to be done to develop proper test methods and assessment strategies that can untangle these risks, he says, particularly at low doses.

Once an endocrine disrupter enters the body, in principle it can target any organ having hormone receptors with which it can interact. "We have to check from top to toe," says Wolfgang Wuttke, a biomedical researcher at the University of Göttingen, Germany. His lab consortium will focus on known estrogenlike rogues, including pesticides, ultraviolet absorbers in sunscreens, and phytoestrogens used in hormone replacement therapy. The researchers' goal is to reveal to what extent these compounds influence gene expression in nonreproductive organs.

Observers predict that the initiative's megacollaboration credo will bear fruit. "They have the critical mass to advance the field and see what is really important," says Tuomo Karjalainen, a scientific officer at the European Commission in Brussels.

–SONJA LORENZ

Sonja Lorenz has just completed an internship in *Science*'s Cambridge, U.K., office.