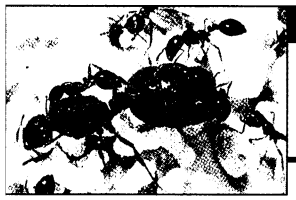
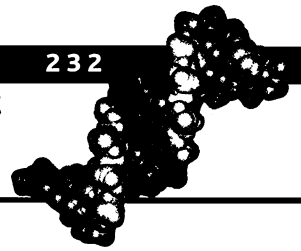


231 Fire ants reduce biodiversity



232 Reengineering life's chemistry

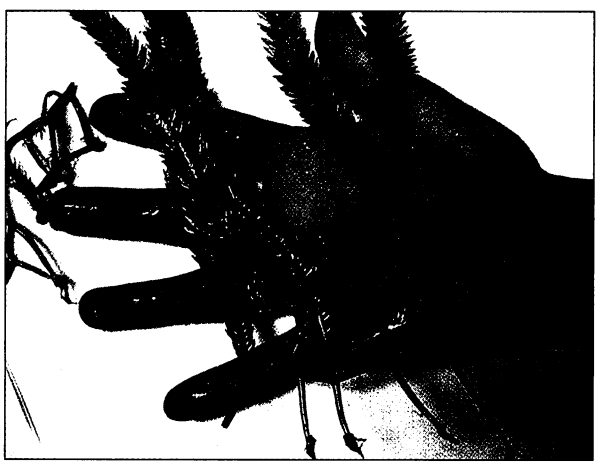
238 Toward a virtual observatory

(*Science*, 17 September 1999, p. 1834). "It's a rare chance to stop an invasion once it's started," says marine biologist Andrew Cohen of the San Francisco Estuary Institute. He and others also hope U.S. officials will avoid the mistakes made in Europe, where governments initially ignored warnings about *C. taxifolia*. "This is almost a test case of the new resolve to deal with this problem" of invasive species, says ecologist Daniel Simberloff of the University of Tennessee, Knoxville.

C. taxifolia is native to various tropical seas. But in 1980 an aquarium in Stuttgart, Germany, began sharing with other aquaria a showy clone that grew fast in cold water. The organism's potential for triggering an ecological disaster didn't become apparent, however, until 1989, when French scientist Alexandre Meinesz noticed a flourishing *C. taxifolia* patch in the waters off the Monaco aquarium. Meinesz's 1999 book, *Killer Algae* (*Science*, 10 March, p. 1762), describes the bureaucratic fumbling and the seaweed's relentless spread as French officials dithered 2 years before reacting. The alga now carpets 4600-and-counting hectares of sea floor, wiping out native grasses from Spain to Croatia.

The story was familiar to Rachel Woodfield, a marine biologist with the consulting firm of Merkel & Associates in San Diego, who in mid-June spotted some unfamiliar seaweed growing in a lagoon. The 10-meter-by-20-meter patch and smaller, scattered patches had apparently edged out the eelgrass within a few years. Woodfield consulted with algae experts, including Meinesz, who fingered the Mediterranean clone or one just as invasive. And that set off alarm bells. If the alga, now 30 kilometers north of San Diego, gets loose throughout California, says Bob Hoffman of the National Marine Fisheries Service Southwest Region, "the whole rocky reef plant and animal assemblage off our coast would be dramatically transformed."

As *Science* went to press, experts were awaiting results of genetic tests to confirm the invader's identity. But with evidence pointing toward the Mediterranean clone, 10 agencies and groups are now scrambling to wipe out the algae in an effort that will likely cost at least $500,000. As a first step, they've quarantined the lagoon, owned by a power plant and used for boating, to prevent tiny fragments of *C. taxifolia* from being spread by boat anchors. Within a week or two, they plan to cover the seaweed patches with tarps soaked with an herbicide, most likely chlorine or copper sulfate. The next step is long-term monitoring, including pamphlets to alert boaters and divers to look out for other colonies.



Dead ringer. *Caulerpa taxifolia* algae found near San Diego looks just like a weedy clone that's wreaked havoc in the Mediterranean.

CREDIT: MERKEL & ASSOCIATES

In tackling *C. taxifolia*, the San Diego group is wading into uncharted waters. Although many weedy plants and non-native animals have been extirpated from lakes and land, only two marine invaders—a zebra mussel–like species in Australia and an abalone parasite in California—have reportedly been eradicated. U.S. experts have long feared that they might one day need to battle *C. taxifolia*. In 1998, Cohen spearheaded a lobbying effort that succeeded last year in adding the clone to the U.S. Noxious Weed list, which bans its sale and transport.

A 1999 presidential order calling on federal agencies to thwart invasives may provide additional weapons for battling *C. taxifolia* and other troublemakers. Simberloff says he's "very impressed" with a draft interagency plan that has just been developed. But Cohen is reserving judgment, noting that federal rules to crack down on species spread by ship ballast water (see p. 241) still lack teeth. Even so, a victory over San Diego's patch of *C. taxifolia* will lift his spirits. "I do think there's a good chance of eradication," Cohen says. **–JOCELYN KAISER**

SCIENTIFIC PUBLISHING

Publish and Perish in The Internet World

NEW YORK CITY—When 120 leaders in publishing and biomedicine met here last week to talk about the Internet's effect on scholarly journals, it didn't take long for disagreements to surface. Participants clashed over two very different visions of the future—one predicting that private firms will continue to produce the most reliable and readable journals, the other that scientists will soon abandon traditional journals and share results directly with other researchers on the Internet.

The seeds of this debate were sown 16 months ago, when Harold Varmus, who was then director of the National Institutes of Health (NIH), and Stanford University geneticist Patrick Brown floated a radical plan for an NIH-backed preprint journal and biomedical archive (*Science*, 12 March 1999, p. 1610). Since then, the scope of NIH's electronic publishing venture—now called PubMed Central—has been scaled back, and the public archive has been slow getting started.

David Lipman, director of NIH's National Center for Biotechnology Information, which is running PubMed Central, reported at the meeting that his staff is making steady progress putting articles online from the 20 journals that have so far agreed to provide published papers for the archive. But his team has "bumped into technical problems," he said, particularly with one of the most prominent contributors, the *Proceedings of the National Academy of Sciences* (*PNAS*). So far, according to a *PNAS* staffer, two 1999 issues have been posted. Meanwhile, plans to publish original, nonreviewed research at PubMed Central are being put aside for now.

Those difficulties have not discouraged Vitek Tracz, head of the London-based publishing company, Current Science Group. In May, Tracz—whose company sponsored the New York meeting—started his own Internet publication called BioMed Central, which will be free of charge to authors and readers. (Its first papers are still in review.) "Our mantra is that we will never charge for primary research reports," Tracz says.

Although Tracz says he has no definite business plan for BioMed Central, he aims to use it to establish credibility with scientists and through this process, to develop other publications and news services that

will make a profit. Already, BioMed Central has recruited an impressive board, including Varmus, now president of the Memorial Sloan-Kettering Cancer Center in New York City, Steven Hyman, director of the National Institute of Mental Health in Bethesda, Maryland, Philippe Kourilsky, director of the Pasteur Institute in Paris, and Mitsuhiro Yanagida, a molecular biologist at Kyoto University in Japan.

At the New York meeting, the contrarian role fell to Pieter Bolman, president of Academic Press of San Diego, California. In a brief talk, he dismissed the free publication schemes as utopian, joking that they looked like the work of "academics on the loose" or "a communist plot." To put all biomedical research data into a single open archive is "asking for trouble," Bolman said, because it asks "existing publishers to give up their files" and "commit economic suicide." The journals won't do it, Bolman predicted, unless forced by the government.

The PubMed Central experiment, Bolman argued, is plagued by "a mainframe mentality"—meaning centralized management. Bolman touted an alternative, a publisher-initiated venture called CrossRef, launched in June. Later this year, it will house an electronic index with links to 3 million articles in 4000 journals. But unlike users of PubMed Central, users of CrossRef will have to pay a fee in most cases to get the full text. PubMed Central "has served its purpose," Bolman asserted: "I invite you to join CrossRef and get it all over with."

The experiment in electronic publishing has begun, and "we are tacking to a distant port."

—Harold Varmus

Infuriated, Brown rose to give the final talk and fired a broadside at "parasites" who get the work of scientists for free, take forever to publish it, and charge readers a high price for a product they often make worse by editing. Instead of joining CrossRef, Brown urged scientists to lend support instead to free alternatives like PubMed Central. Brown's comment to the publishers: "We'll call you if we need you, but don't sit by the phone." But right now, Brown himself is calling the publishers, because he wants them to donate their back issues to PubMed Central—"so that people can see the value" of having a free electronic archive.

Although participants in the meeting diverged sharply on how the Internet will affect publishing, all seemed to agree with Varmus's comment that the experiment in electronic publishing has begun, and that "we are tacking to a distant port" with winds that sometimes favor and sometimes hinder progress.

–ELIOT MARSHALL

ARTHRITIS

A Gene for Smooth-Running Joints

At first glance, tartar control toothpaste and water softeners seem to have little in common with the crippling joint erosion that haunts tens of millions of arthritis sufferers worldwide. But a new study on page 265 of this issue suggests that a genetic defect in mice causes the joint's cartilage cells to pump insufficient amounts of pyrophosphate—a natural water softener—into the joint cleft, and this in turn leads to the formation of bony spurs that eventually stiffen the joints completely. Because humans have an almost identical gene, and disorders such as osteoarthritis also feature an abnormal outgrowth of bones, some arthritis researchers are hopeful that these new findings may point the way toward a new class of pyrophosphate-based drugs similar to the antiscaling chemicals in washing powders and toothpaste. But, as many of the researchers point out, the numerous roads that lead to human joint degradation make a single cure-all unlikely.

Arthritis and other rheumatic afflictions dwarf cancer and heart disease in terms of the disability they cause. The World Health Organization estimates that arthritis-related diseases—of which there are more than 100 different forms—afflict half the world's population over 65. Although sports injuries, age, and obesity are among the most common risk factors, about half of all arthritis cases also have a strong hereditary component.

To pinpoint genes that contribute to a specific disease, researchers often turn to animal models that mimic the ailment. Developmental geneticists David Kingsley, Andrew Ho, and Michelle Johnson of the Stanford University School of Medicine have been trying to unravel the genetic mutation at work in a strain of mice called *ank*, which has progressive ankylosis, or fusion of the bones. The disease starts by stiffening the digits and paws, then spreads to virtually every joint in the body, including the spine. By about 6 months of age the animals are completely immobilized and eventually die. Despite its unparalleled severity, the mouse disease and various forms of human arthritis share several hall-

ScienceScope

Castle Revolt Scientists at the Smithsonian Institution in Washington, D.C., are up in arms about what they see as a raid on their research funds. The new secretary, Lawrence Small, ordered his managers last month to freeze all discretionary money in a special account used to pay for small research projects, new initiatives, and special travel, according to a staff letter to Small that was obtained by *Science*. Most of this money—between $3 million and $16 million, according to a museum official—comes from researchers themselves, who solicit gifts and donate honoraria, consulting fees, and royalty payments. Staff scientists asked the secretary to reconsider. When he didn't respond, the Council of the Senate of Scientists at the National Museum of Natural History protested in a 22 June letter, warning that the move would be a "devastating blow to morale." Small's failure to offer any explanation for the move, the memo states, "gives the impression of an arbitrary, ill-informed decision-making process." Small, a former banking manager, is just trying to sort out the Smithsonian's finances, explains spokesperson David Umansky. "No money is being taken," Umansky says. The secretary is merely "asking what these funds are used for." Another spokesperson says Small likely will decide what to do in the next 2 weeks.

CREDIT: SMITHSONIAN

Larger Pie Japanese R&D boosters are optimistic that the government will back an ambitious plan to raise science and technology spending to 1% of the country's gross domestic product (GDP) within 5 years, with a special emphasis on funding information technology and life sciences. The 1998 level—the last for which complete figures are available—was $39 billion or 0.7% of Japan's GDP. (U.S. government spending that year was about 0.76% of GDP.) The goal may be included in a 5-year science and technology plan being drawn up now by the advisory Council for Science and Technology for the 2001 budget, which begins next April. Hiroo Imura, former president of Kyoto University and a key member of the council, says that because R&D spending has already grown rapidly the group initially had modest expectations. But backing for a more aggressive approach found "many supporters among the [ruling] Liberal Democratic Party," Imura says. He warns, however, that the plan ultimately will have to win the backing of the powerful Ministry of Finance.