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,

> **The experiment in electronic publishing has begun, and "we are tacking to a distant port."**
>
> **—Harold Varmus**

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."

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.

organization for 15 British societies, to stem a perceived brain drain to better paying Ph.D. programs outside the United Kingdom. It should also reduce the average debt of a science major entering graduate school, now roughly $8000, says Peter Campbell, a biochemist at University College London.

The move to beef up infrastructure and raise stipends "will go some way toward attracting and retaining good scientists in the U.K. science base," says Sir Aaron Klug, president of the Royal Society. However, Klug and others admit that it won't address another source of brain drain—U.K. postdocs headed to the United States for positions not available at home. **–RICHARD STONE**

PARTICLE PHYSICS

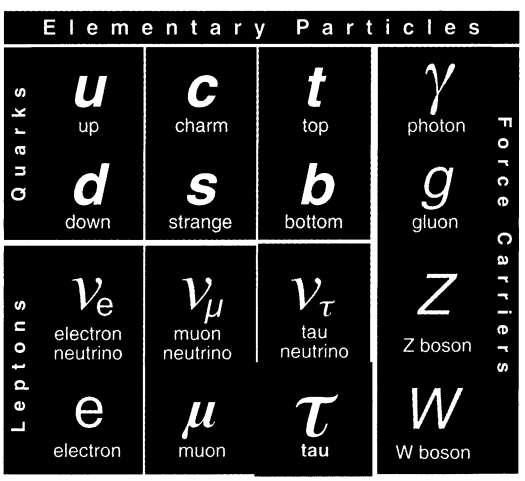
CERN Collider Glimpses Supersymmetry—Maybe

It's a notion worthy of *The X Files*: a shadowy world of doppelgangers, existing in eerie counterpoint to the one we know. Last week, particle physicists at the CERN laboratory in Switzerland announced that they may have caught the first glimpse of that world. By smashing together matter and antimatter in four experiments, they detected an unexpected effect in the sprays of particles that ensued. The anomaly is subtle, and physicists caution that it might still be a statistical fluke. If confirmed, however, it could mark the long-sought discovery of a whole zoo of new particles—and the end of a long-standing model of particle physics.

Other scientists are intrigued by the findings. "Often with an anomalous result, after a few hours' work, you say, 'This can't be right,' but here this is not the case," says Gordon Kane, a physicist at the University of Michigan, Ann Arbor. But they are also skeptical. "After having been bitten 15 times, I'm twice shy," jokes CERN physicist John Ellis. "I think it's probably going to turn out to be some background fluctuation, unfortunately."

The finding threatens the slightly creaky Standard Model of particle physics, which provides a mathematical framework that binds together all of the fundamental particles (quarks, neutrinos, electrons, taus, muons, gluons, and so forth). And it supports a newer, fancier model known as supersymmetry. By linking the particles that make up matter (fermions) with those that carry forces (bosons), supersymmetry unifies all the quantum forces at very high energies. In the process, it also doubles the roster of particles. Each fermion, such as a quark, neutrino, electron, or tau, has a bosonic twin: an s-quark, neutralino, s-electron, or s-tau. Likewise, every boson has a fermionic twin: The photon has the photino, and each gluon has a gluino.

The CERN scientists put the models to the test at the Large Electron-Positron Collider (LEP), a 27-kilometer magnetic ring near Geneva where physicists had long been smashing electrons and antielectrons together, creating showers of subatomic debris. They were particularly interested in showers containing pairs of tau particles. Like electrons, muons, and quarks, tau particles are thought to be fundamental particles—indivisible chunks of matter. The Standard Model allows several different chains of particle interactions, known as channels, by which a colliding electron and antielectron can produce a pair of tau particles. Supersymmetry allows not only all of those channels, but also others that involve the twin particles unknown in the Standard Model. Each theory also predicts how many tau particles ought to result from collisions at different energies—but the answers aren't always the same.



Half full? Swiss results hint that each "standard" particle (above) has a shadowy supersymmetric twin.

Those differences were the test. At low energies, the number of tau particles LEP produced matched calculations based on the Standard Model. But in 1998, when engineers at CERN pushed the energies of the collisions above 189 billion electron volts, things began to change. "Over the last couple of years, there has been a slight excess," says CERN physicist Gerardo Ganis. Instead of observing about 170 tau pairs of a certain type, as the Standard Model predicts, physicists have seen 228—a figure consistent with supersymmetry.

Barring some unknown type of systematic error that affects each of the four experiments, each experiment has roughly a 5% probability of seeing the excess because of a chance statistical fluctuation, Ganis says. "But when put together, it's a fraction of a

CREDIT: CERN

ScienceScope

Life Count It's a Herculean bookkeeping exercise, but taxonomists the world over are completing the first phase of an international effort to compile an Internet-based directory of all known life-forms. Dubbed Species 2000, the collaborative research project begun in 1996 aims to link existing databases on everything from blue whales to microscopic bacteria. The result would be a boon for basic research as well as biodiversity and conservation efforts.

It's no easy task. "Our virtual catalog has to be created from an array of autonomous databases all around the world, which are on different platforms and quite variable in terms of quality and content," says project coordinator Frank Bisby of the University of Reading, U.K. The software to make the links, however, is now in place, and by the end of the year, taxonomists will connect as many as 20 databases, comprising about 300,000 species. To complete the final catalog encompassing all 106 global databases and nearly a million species, however, researchers will need a hefty cash injection. "It costs well over $100 per species to set up a global database," says Bisby.

Sowing Solutions Genetically modified (GM) crops are critical to feeding the world's booming population, but scientists and industry must find ways to enhance and share their benefits, according to a report issued by seven science academies around the world this week. The backlash in Europe and the United States against GM foods was one impetus for the report, says U.S. National Academy of Sciences president Bruce Alberts. Partly to counter what he calls the "hysteria," his institution worked with the Royal Society of London and the Brazilian, Chinese, Indian, Mexican, and Third World science academies. The resulting report calls for more research on GM crops useful in developing countries, such as nutrient-enchanced foods and salt-tolerant plants.

Perhaps the strongest message concerns patents and technologies that would prevent farmers from saving seeds. The academies urge companies and research institutions to "make arrangements to share GM technology," including "special exemptions" for poor farmers. Says Alberts: "There has to be a solution that would help everybody to come out better."

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