NETWATCH

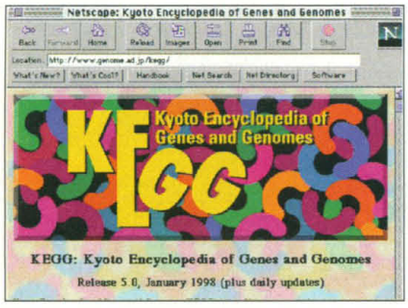
edited by JOCELYN KAISER

Gene Wiring Diagrams

SITE VISIT

Genome projects do a great job of providing a gene's sequence and protein product, but ask them for functional info—what that protein does in the cell—and you're likely to come up empty. Helping to fill the gap is the Kyoto Encyclopedia of Genes and Genomes (KEGG), a site that aims to make sense of the flood of sequencing data by linking genes to biochemical pathways.

Launched in 1995 as part of Japan's national genome program, KEGG—based at the Institute for Chemical Research, Kyoto University—holds molecular and gene catalogs for all known compounds in living cells, along with some 100 maps of metabolic and regulatory pathways. It also contains genome maps—viewable with the Java miniprograms known as "applets"—for the world's genome projects. And KEGG links into protein and gene databases such as SWISS-PROT and GenBank. Searching for "alcohol dehydrogenase," for example, pulls up maps showing the enzyme's position in five metabolic processes, or its gene's sequence in the rat genome. Especially useful, says KEGG leader Minoru Kanehisa, is that you can feed in several genes or enzymes and find out what pathways connect them. That makes KEGG a biological "wiring-diagram database," he explains.



www.genome.ad.jp/kegg/

Bioinformatics expert Chris Sander of Millennium Pharmaceuticals in Cambridge, Massachusetts, calls KEGG "the most comprehensive and easily accessible" metabolic pathway database; unlike many such ventures, he says, "it has a good chance of surviving." This year, Kanehisa expects to add more regulatory pathways and fill out gene information on higher organisms.

New Code May Foil Prying Police

NEWS

Bankers, spies, and others who want a little electronic privacy can now disguise their messages with a clever alternative to encryption, the usual technique. The method, dubbed "chaffing and winnowing," is delighting computer scientists and privacy advocates, as it could make moot federal attempts to give law enforcement agencies copies of encryption "keys."

Encryption encodes messages by altering each bit of information—changes that a message's recipient undoes with a key. But Massachusetts Institute of Technology cryptographer Ronald Rivest's new technique doesn't alter message bits. Instead, it tags each bit with a "message authentication code" (MAC)—normally a few characters within a message used to verify the sender's identity. The program then buries the bits in a haystack full of random bits with incorrect MACs, called "chaff." A spy can't distinguish genuine bits from phony data. The intended recipient, however, can use a secret code shared with the sender to "winnow" out the fake bits.

Rivest's idea, posted at **theory.lcs.mit.edu/~rivest/chaffing.txt** on 17 March, has drawn a stream of inquiries. One reason: There are no federal curbs on using authentication, so the method could foil the Justice Department's push to require access to keys, as well as U.S. restrictions on exporting encryption codes. AT&T cryptographer Andrew Odlyzko says Rivest has shown that "if you have an authentication method, you can use it for encryption."

Other cryptographers say Rivest's method is unlikely to find wide commercial use, as more efficient encryption recently became available abroad on the Internet, despite export curbs (**www.pgpi.com**). But "chaff and winnow" may be quite a hit with the program-it-yourself crowd.

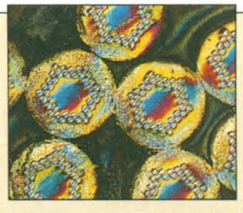
HOT PICKS

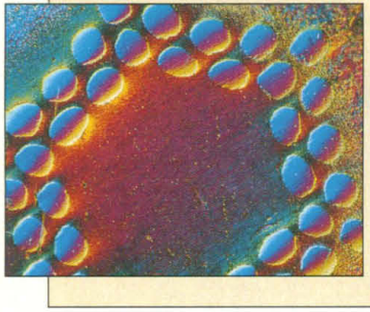
Deep data. The Ocean Drilling Program has put its thick tomes of cruise data and proceedings online for the first time at **www-odp.tamu.edu/publications**.

Stubborn bugs. Don't resist checking out a new site where medical researchers are trying to track vicious new microbes around the globe: **resistanceweb.mfhs.edu**.

Wonk's delight. Want to know whether your grant agency is in the clover or seeing red? For spending bills, analysis, and other nitty-gritty policy details, head to **www.tulane.edu/~aau/index.html**, the Association of American Universities site.

NET PICS





Close encounters. These flea's-eye views of a superconducting wire's 60-micrometer niobium strands come from a virtual optical microscope, the latest addition to Molecular Expressions, a Web site run by Michael Davidson's group at the National High Magnet Laboratory, at Florida State University (**micro.magnet.fsu.edu**). With the click of a mouse, one can focus on a DNA crystal or zoom in on a moon rock or compact disc. The demos are meant to give kids and other visitors "a really good grasp of what microscopy can do without ever having to touch a microscope," Davidson says. He plans to add real-time images via a Web Cam later this year. Also on the site are more than 2000 of the magnet lab's 70,000 psychedelic close-ups of everything from liquid crystals to spinach and ice cream, many of which have been licensed for calenders, ties, and other tchotchkes.

SCIENCE ONLINE

Today, *Science's* Next Wave (**www.nextwave.org**) unveils a new design that should make navigating the site much easier. Next Wave is also hosting an interactive feature about careers in environmental science. It includes tips on finding a job as a consultant, vignettes on how some environmental scientists got to where they are now, as well as book and Web site reviews to help you jumpstart your career.

Send Internet news and great Web site suggestions to netwatch@aaas.org