near-term benefit of the mouse sequence: Geneticists want to use the mouse genome to find and characterize new genes in the human sequence, but that would require identifying genes in the mouse at very early stages in the project and also discerning areas where the mouse and human genomes are nearly the same. Roe had broader concerns as well: "I was afraid that there would be momentum to do something that was not well thought out."

So instead of settling on a sequencing strategy right away, the group decided to test the validity of the hybrid approach, and especially whether shotgun data could aid gene discovery. "The answer came back a resounding 'Yes,' " says Green. Working with three other network members, Genome Therapeutics Corp. in Waltham, Massachusetts, simulated shotgun data by stripping down known sequences to a bare minimum. The group then evaluated how useful these new data would be for finding conserved sequence in both human and mouse genomes—sequence that would likely represent undiscovered genes. At last week's meeting, Lynn Doucette-Stamm of Genome Therapeutics reported that gene-finding programs could still pick up almost all the coding regions in shotgun data. What's more, those conserved regions helped the researchers pinpoint regulatory regions in both genomes.

Although the network has agreed to tackle "most" of the mouse genome with the shotgun approach, the researchers are still debating exactly what "most" means. Last week, Washington University's John McPherson suggested at least three-quarters. But another network member, W. Richard McCombie of Cold Spring Harbor Laboratory in New York, is not comfortable with such a high proportion. Even Gibbs has reservations. "The real scientific issues [about the optimum ratio] remain unsettled," he concedes. But the network expects to settle them soon, adds Francis Collins of NHGRI, who heads the network. Already, some mouse DNA is in the sequencing pipeline, with much more expected in the coming months. Boasts McPherson: "You should start seeing some mouse sequence hitting GenBank" soon.

–ELIZABETH PENNISI

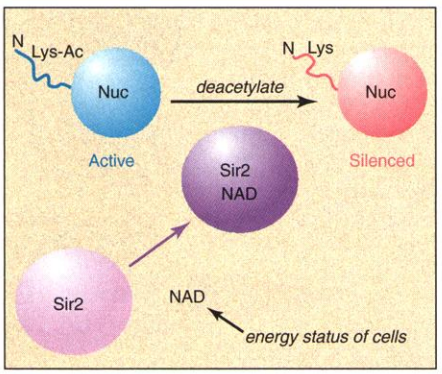
CELL BIOLOGY

New Clue to Age Control in Yeast

In fairy tales, you drink a magic potion to live longer. In real life, just eating less might do the trick. For years, researchers who work on aging have known that they could extend the lives of species from yeast to rodents by restricting their food intake. The mechanism, however, has remained mysterious. Now, a team led by molecular biologist Leonard Guarente of the Massachusetts Institute of Technology may have turned up part of the answer. The group has identified what may be a biochemical link between calorie restriction and increased life-span, at least in yeast.

The link appeared fortuitously during studies of a phenomenon called silencing that both turns genes off at particular chromosomal regions and also helps maintain the structural integrity of the DNA. In previous work, Guarente's group showed that Sir2, a protein needed for silencing in yeast and possibly other organisms, controls yeast life-span. This was likely due to its silencing activities, but no one knew exactly how the protein performed this silencing feat—much less how it might be related to aging.

As the researchers report in the 17 February issue of *Nature*, Sir2 might work by removing acetyl chemical groups from the histone proteins that bind DNA in the chromatin, a chemical change that ultimately ties up the DNA so that the proteins needed for gene activity can't gain access. Geneticists had suspected for many years that such an activity was behind Sir2's silencing action, but had never been able to catch the protein in the act of removing the acetyl groups. The Guarente team succeeded while actually studying a different type of reaction that is also catalyzed by Sir2. In the course of that work, they added a chemical called NAD to the reaction mixture. They found that when—and only when—NAD is present, Sir2 removes acetyl groups from a synthetic portion of a histone.



Silencer. With NAD, Sir2 can remove acetyls (Ac) from certain lysines (Lys) in the histones bound to DNA in the nucleosomes (Nuc).

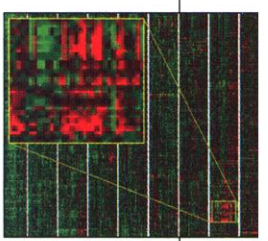
That discovery also provides a link to calorie restriction, because NAD normally helps the cell capture energy from food. When food is restricted, concentrations of available NAD could rise, Guarente proposes. This rise, in turn, could boost Sir2's silencing activities to help cells live longer. "If you lose silencing over time, you could get inappropriate gene expression, and these changes could be responsible for some of what we see in aging."

George Roth, who studies caloric restric-

CREDITS: (LEFT TO RIGHT) L. GUARENTE; J. TRENT

ScienceScope

Next-Generation Genomics Worried that the upcoming human genome sequence "won't be very useful" by itself, Francis Collins, director of the National Human Genome Research Institute (NHGRI), wants to start a new network of interdisciplinary centers that will take the next step in genome studies. Later this month, Collins hopes his Advisory Council will approve plans to solicit proposals for new Centers of Excellence in Genomics.



Over the next 3 years, Collins wants to jump-start about a dozen of the new centers. Each could have an annual budget of up to $4 million, he says, enough to combine training and research in hot areas, such as DNA chips (above). "Many centers have raw talent but no mechanism for pulling it together," he says, adding that the effort could become "a large part of [NHGRI's] portfolio."

The potential cash infusion could come at a good time for the many universities—from Caltech to Harvard—that are spending heavily on new genomics operations. "There are clear benefits to getting multiple investigators together," says Robert Waterston, who heads sequencing efforts at Washington University in St. Louis, Missouri.

Still Connected Luther Williams, who last summer was replaced as head of the education directorate at the National Science Foundation (NSF) (*Science*, 13 August 1999, p. 997), is still on the agency's payroll despite taking a job across the street with Tulane University's Payson Center for International Development and Technology Transfer. Williams is one of 119 science administrators at NSF employed under the 1970 Intergovernmental Personnel Act, which allows the government to pay above-scale salaries to attract scarce talent. But most of NSF's so-called IPAs have been recruited temporarily into the agency from universities or industry. Williams, in contrast, is one of just nine officials who have been "lent out" to another institution.

NSF deputy director Joseph Bordogna, himself a former longtime IPA, says that Williams is working on issues relating to his 10-year NSF tenure, including education reform and increasing minority participation in science. Williams declined to comment on his duties at the center, a pet project of Tulane's president emeritus, Eamon Kelly, currently head of the National Science Board.

says Landweber.

"It is the world champion so far," says Adleman, who, along with other biochemists and computer scientists, is trying to make a molecular computer do a problem that a human can't do in a reasonable amount of time. "[Landweber] has got the inside track for trying to reach that milestone first."

To develop practical nucleic-acid computers, however, scientists will have to clear some major hurdles, such as figuring out how to correct errors and how to produce and handle large volumes of nucleic acid. Kasparov has no reason yet to feel threatened by beakers of glop, but Adleman is hopeful that nucleic-acid computers will be more than mere curiosities. "Here's nature's toolbox, a bunch of little tools that are dirt cheap; you can buy a DNA strand for 100 femtocents," he says. "Here's a great set of tools, we know they can do lots—let's build cool things!" **–CHARLES SEIFE**

SCIENTIFIC MISCONDUCT

Fired Researcher Is Rehired and Refired

A bitter and long-running dispute at the University of Arizona (UA) over the firing of a senior biomedical researcher for scientific misconduct has taken a strange new turn. On 4 February, UA president Peter Likins reinstated the researcher he had fired 19 months ago—former Regents Professor Marguerite Kay, an expert on the immune system and Alzheimer's disease. But, on the same day, Likins notified Kay that she was being dismissed again and he barred her from the campus, citing a policy that permits him to exile a faculty member whose presence is deemed "likely to constitute a substantial interference with the orderly functioning of the university. ..." Likins gave the same reasons as before: A faculty panel ruled in 1998 that Kay had engaged in scientific misconduct and neglected her duties as a professor (*Science*, 5 November 1999, p. 1076).

No reprieve. Marguerite Kay has been barred from the UA campus.

CREDIT: C. RICHARDS

This bizarre twist is the result of a judge's rulings last year that the university had acted in an "arbitrary and capricious" manner in firing Kay without a regular personnel hearing, and that she was wrongly denied full legal representation in a misconduct hearing. Likins informed Kay she had a right to appeal the redismissal, which would presumably trigger a personnel hearing.

Kay's supporters on the faculty were outraged by these moves. Two lawyers on the faculty senate immediately objected that Likins had violated Kay's rights and, thereby, the rights of all tenured faculty members. Attorneys Roy Spece Jr. and Andrew Silverman read a protest note during a senate meeting on 7 February in which they urged Likins to redo the entire investigation against Kay. The findings of misconduct against her, they argued, were rendered "null and void" by the court rulings. Judge Stephen Villarreal of the state court for Pima County found that the faculty-run hearing that investigated and condemned Kay's research in 1998 was deficient because Kay's attorney was not permitted to speak during the proceedings (*Science*, 26 November 1999, p. 1657). As a result, "the only proper way to proceed is to return to the very beginning and to do it right this time," said Spece and Silverman.

Likins clearly isn't interested in doing that. In a memo to department heads on 4 February, he noted that the court "did not make any determination regarding the substantive basis for the decision to dismiss Dr. Kay." And he said that the work of several faculty committees that investigated the case "will be respected." Likins declined to comment, according to university spokesperson Sharon Kha, because university rules forbid public discussion of personnel matters. Kha said she was limited to stating that Kay is once again on the faculty—nothing more.

Kay also could not be reached for comment. But her attorney in Tucson, Don Awerkamp, predicted that the decision not to redo the investigation from the top but to rely on the disputed misconduct investigation of 1998 will waste time and "cost hundreds of thousands of dollars more in litigation expenses."

On Kay's behalf, Awerkamp filed suit against the university in December, demanding $3 million for breach of contract. The suit also seeks additional damages for violation of Kay's rights to due process in job termination, and for pain and suffering and other harms. Included in the list of defendants are the university's board of regents, Likins, the chief counsel, the former research administrator, the oncologist who chaired the panel that investigated Kay, and two other faculty members who stepped for-

ScienceScope

Do It Again Expanding overcrowded labs and replacing aging equipment are likely to top the list of priorities in Japan's next 5-year science plan. This month a subgroup of the Council for Science and Technology, the nation's highest science advisory body, is finishing up reports on the nation's research needs, in anticipation of a formal request from the prime minister for a detailed plan covering the 5-year period beginning in April 2001.

Lab overcrowding has become "a big problem" as science funding has boomed, says Hiroo Imura, a former president of Kyoto University. Imura chairs the policy committee, whose panels also highlighted the need to attract more non-Japanese researchers and award more competitive grants.

The previous plan, Japan's first, included an ambitious 17 trillion yen ($162 billion) spending goal that the government achieved through a combination of regular and supplemental budgets. A sluggish economy may preclude repeating that sharp increase, says Hiroyuki Yoshikawa, a former University of Tokyo president and council member. But political support for science is so strong, he believes, that "even if the economy worsens, [budgets] won't decrease."

Quantum Leap The U.S. military plans to spend $15 million to nurture the fledgling field of quantum teleportation, which seeks to harness the bizarre behavior of atomic particles to process information at breathtaking speeds (*Science*, 23 October 1998, p. 637). The technique allows scientists to transfer a quantum-mechanical property, such as spin or polarization, from one particle—a photon or an atom, for instance—to another, even if the two are separated by millions of kilometers.

Three academic teams—based at the California Institute of Technology, the Massachusetts Institute of Technology, and the University of California, Los Angeles—will each get about $1 million a year over the next 5 years from a coalition of defense funders to work on different aspects of quantum communication. The Caltech team, for instance, will work on error correction methods, while MIT and UCLA will tackle optical fiber and memory problems.

The teams "fit very nicely together," says physicist Henry Everitt, who heads the effort for the Army Research Organization.

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