the nine sugar units found in mammals, says Seeberger. And most of the others are expected to follow quickly. Still, Seeberger acknowledges that the new synthesizer won't be able to provide all possible oligosaccharides, because the group has yet to find the chemistry that allows sugar bonds to form in certain orientations. "That's something we are addressing right now," he says.

Another hitch, Wong notes, is that the strategy requires that a wide variety of sugars with different arrangements of protecting groups be made in advance to serve as the building blocks for oligosaccharide assembly. And for now that must still be done by hand, using slow conventional chemistry. Although that's true, Seeberger notes, this used to be the case for peptide and nucleic acid building blocks, which became commercially available reagents as the machines grew in popularity. Seeberger and Plante say they plan to start a company this summer to commercialize their automated synthesizer and supply many of the needed reagents. **–ROBERT F. SERVICE**

WOMEN IN SCIENCE

College Heads Pledge To Remove Barriers

BOSTON—The leaders of nine top U.S. research universities this week pledged to smash the glass ceiling that hinders women from advancing at their institutions. Meeting on Monday at the Massachusetts Institute of Technology (MIT), the all-male group stopped short of setting a specific agenda but acknowledged that women face greater obstacles in climbing the academic ladder. "It's momentous just to get these nine together," says Patricia Jones, a biologist and vice provost at Stanford University in Menlo Park, California, who attended the meeting. "Count me as a happy camper," adds Stanford economist and participant Myra Strober.

Hosted by MIT president Charles Vest, this week's meeting grew out of a 1999 internal report that found the small number of MIT women science faculty members had consistently less lab space, recognition, and leadership responsibilities than their male counterparts (*Science*, 26 March 1999, p. 1992). In a one-page statement, the presidents agreed that barriers exist, that more data are needed, and that they would work together to improve the situation. The discussions ranged from offering child care at academic conferences to monitoring the progress of young faculty and guarding against gender imbalances in hiring and promotions. Following the MIT model, a number of schools are putting together their own reports. Attending the meeting were the presidents, chancellors, or other senior administrators of Harvard, Princeton, Stanford, and Yale universities, the universities of California–Berkeley, Michigan, and Pennsylvania, the California Institute of Technology, and MIT.

A major focus was on quantifying the problem (see table). Shirley Malcom, education chief for the American Association for the Advancement of Science (AAAS, which publishes *Science*), laid out the issue in the day-long, closed-door meeting. "You don't collect what you don't want to know, and you can't make progress to a goal without measuring it," she told *Science*. Vest says that although the group did not endorse a collective approach to data gathering, participants agreed to find ways to fill in the gap. Such details likely will be discussed at a second meeting tentatively slated for 2002.

Financial backing for the meeting came from the Ford Foundation and an anonymous donor, each of whom gave MIT $500,000 last spring to address the issue of women and minorities in academic science. "They encouraged us to reach out," says Nancy Hopkins, an MIT biologist and a leader of the MIT study effort. MIT is chipping in a similar amount.

In California, meanwhile, state legislators planned a 5-hour hearing this week on equity and retention of female faculty members in the University of California (UC) system, the nation's largest. The hearing stems from concerns by UC faculty members that the recent abandonment of state affirmative action policies aimed at increasing the number of minority students and faculty members is also eroding the hiring of women.

At UC Davis, for example, 37 out of 44 professors hired in 1999 were male. And the percentage of women hired in the overall UC system has declined from 36% in 1996—when the policies were still in place—to about 24% in 2000. "The situation is now critical," says California Senator Jackie Speier (D), who was to chair the hearing. A state audit of UC's hiring policies is due out next month. **–ANDREW LAWLER**

TOUGH TREK FOR WOMEN CHEMISTS

University	Full professor	Associate professor	Assistant professor
Berkeley	*38/3	4/1	9/1
Caltech	20/2	3/0	4/1
Harvard	16/1	0/0	4/0
MIT	21/3	2/0	6/1
Michigan	26/1	5/2	7/1
Penn	22/2	5/0	4/1
Princeton	21/0	2/1	2/0
Stanford	18/1	3/0	4/0
Yale	18/1	1/0	4/1
TOTAL	200/14	25/4	44/6
Percentage	7%	16%	14%

* All ratios indicate total/women professors.

No entrance. Women chemists are filling the first rung at top schools at rates far below their share—31%—of the Ph.D. pool.

SOURCE: *CHEMICAL AND ENGINEERING NEWS*, 2000 SURVEY

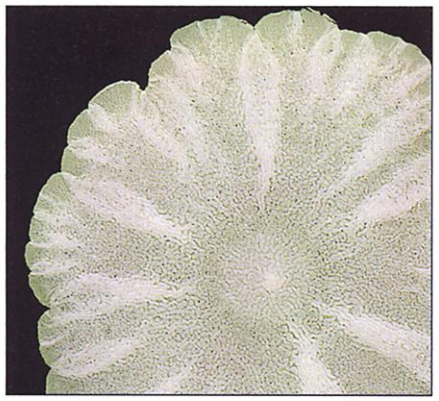
MICROBIOLOGY

Bakers' Yeast Blooms Into Biofilms

Standing alone, fungal and bacterial pathogens are relatively easy prey for antimicrobial drugs. But many of these germs cling together in resilient sheets and globs called biofilms that resist traditional chemical attack. Recently, microbiologists have been getting a fix on what causes bacterial microfilms to form—information that provides potential new targets for infection-fighting drugs (*Science*, 21 May 1999, p. 1302). But lack of a good model system has made fungal biofilms—which frequently contaminate medical devices, cause chronic vaginal infections, and lead to life-threatening systemic infections in people with hobbled immune systems—harder to study. New results should change that.

On page 878, Todd Reynolds and Gerald Fink of the Whitehead Institute for Biomedical Research at the Massachusetts Institute of Technology report that they've coaxed a harmless fungus, bakers' yeast, to form a biofilm. Because bakers' yeast is so well studied—its entire genome has already been sequenced—researchers predict that this new biofilm model will expose vulnerabilities that can be targeted in other, pathogenic fungi. The work "expands [the study of biofilms] with a wonderful, genetically tractable organism," says microbiologist Roberto Kolter of Harvard Medical School in Boston.

Bakers' yeast occasionally forms a film on the surface of sherry, Reynolds says, but it doesn't naturally congregate into a form that fits the operational definition of a biofilm: simply, a film that sticks to plastic. To induce bakers' yeast to do this, the researchers tested several strains and tweaked the yeast's nutrients until they hit on a combination that produces a robust biofilm. The bakers' yeast built the largest biofilms and stuck most stubbornly to plastic when it was fed low concentrations of glucose, suggesting that lean times spur the yeast to change form. Once initiated, the yeast biofilm



Flowering research. Bakers' yeast biofilms may serve as models of those formed by dangerous fungi.

grows steadily outward from a central disc. After a few days, lightly colored spokes appear, consisting of cells that for unknown reasons grow somewhat slower than other cells. This results in a scalloped outline that leaves the mat looking like a flower.

The researchers identified one type of protein the cells need to stick to a surface and to each other. They found they could prevent the yeast from forming sturdy biofilms by mutating either of two genes, *FLO11* or *FLO8*, needed to build a glycoprotein that is located on the cell surface and is known to allow yeast cells to adhere to agar.

Reynolds says he and his colleagues now hope to figure out which genes impel the fungi to band together in the first place and then progress through various stages of biofilm construction. If comparable genes can be found in pathogenic fungi, they would be good targets for preventing biofilm formation. Kolter thinks the approach makes a lot of sense, particularly because different species of fungi tend to use the same sets of tools. Ideally, finding a way to keep dangerous fungi divided will allow them to be conquered. **–LAURA HELMUTH**

CREDITS: (TOP TO BOTTOM) T. REYNOLDS *ET AL.*; J. SCOTT APPLEWHITE/AP

RICE GENOME

Syngenta Finishes, Consortium Goes On

A Swiss-based agrochemical company has completed sequencing the genome of the first important food crop, rice. But scientists who want the data will either have to pay for the right to use it or wait 3 years until an international consortium completes its work on a publicly sponsored—and likely more thorough—version of the same project.

Last week, Syngenta AG of Basel, Switzerland, announced that it had sequenced the majority of the 430 million bases of the rice genome. The work was overseen by its scientists in California and carried out mainly by Myriad Genetics Inc. of Salt Lake City, Utah. The project took 14 months, 6 months faster than planned, and came in under budget, although the company won't divulge the total cost. The results outpace the efforts of the International Rice Genome Sequencing Project, led by Japan, which hopes to finish its work in 2004 at an estimated cost of $100 million.

"On a technical level, they should be very proud," says Rob Martienssen of Cold Spring Harbor Laboratory in New York, a member of the international consortium. "Their coverage is very good, and it's certainly a lot of sequence, but it's still very far from a complete sequence." The Syngenta project sequenced each nucleotide an average of six times. To assure a complete, continuous sequence without gaps, however, each nucleotide needs to be sequenced 10 or 12 times.

In December, plant geneticists announced the complete genome sequence of the first higher plant, *Arabidopsis thaliana*, the model organism of choice for basic plant research but with no commercial value. In contrast, says Steven Briggs, head of the Torrey Mesa Research Institute in California—the genomics research arm of Syngenta—knowing the rice genome should allow scientists not only to improve rice varieties but also to find similar genes expressed in related cash crops such as wheat and barley.

The Syngenta rice map "will not be in the public domain," says Briggs. Instead, Syngenta will provide academic researchers access through scientific collaborations, in return for a share of any commercial inventions stemming from the research. Syngenta also says that it will provide information and technology to the developing world for improving subsistence farming. But Martienssen says the value of Syngenta's work is diminished by its relative inaccessibility: "If it's not really a general public resource, and if it can't be searched, it doesn't have the same impact."

Syngenta has worked with the public rice consortium before, funding work to sequence the ends of the bacterial artificial chromosomes used as the primary template for sequencing. And it's not the only commercial player. Last April, Monsanto finished its own rough draft of the rice genome, which has 4× coverage, and made its data available to the international project.

Getting access to the Monsanto data has allowed the international project to advance its estimated completion date by 4 years. And Japanese members leading the effort on chromosome 1 (of 12) plan to announce their results in March. Takuji Sasaki, director of Japan's rice genome research program, hopes to find ways to accelerate the sequencing but says "it will take additional funding." Adds Martienssen, "We shouldn't sacrifice accuracy or completeness just to speed up."

–R. JOHN DAVENPORT

ScienceScope

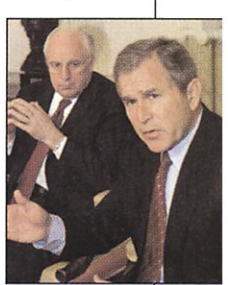
Whistleblower Blowup A government proposal to protect people who report scientific fraud from retaliation is drawing harsh criticism. The Federation of American Societies for Experimental Biology (FASEB) and another group claim that the whistleblower rule proposed by the Department of Health and Human Services (HHS) would be a nightmare to implement.

The draft rule, required by a 1993 law, lays out a detailed process that institutions must use to resolve whistleblower complaints within 30 to 60 days. But the rules are "overly prescriptive," FASEB president Mary J. C. Hendrix wrote in a letter to HHS on 29 January. Hendrix noted that the rule may conflict with other laws, favor accusers over the accused, and prove expensive. The Council on Governmental Relations, which represents 143 research universities, sent a similar letter. "I've never had so many calls from [university] general counsels," says executive director Kate Phillips.

Chris Pascal, head of HHS's Office of Research Integrity, declined comment. A final rule could come later this year, pending review by the new Administration.

Unclear Forecast President George W. Bush kept scientists guessing last week about the fate of federal funding for stem cell research. In his first comment on the issue since taking office, Bush said on 26 January that "there are some wonderful opportunities for adult stem cell research," and that "I believe we can find stem cells from fetuses that died a natural death. And I do not support research from aborted fetuses."

He did not say whether he would block a National Institutes of Health (NIH) plan to fund research on the cells, which could help treat many diseases. And he was silent on cells derived from another controversial source: "excess" embryos slated for disposal at fertility clinics. Aides, however, said Bush was signaling his intent to block NIH's plan.



But stem cell enthusiasts still had reason to hope. Bush's choice for secretary of Health and Human Services, Tommy Thompson, who will oversee NIH, has in the past supported embryonic stem cell research. And in Congress, Senator Arlen Specter (R–PA), a vocal supporter of stem cell research, intends to reintroduce a bill that would allow NIH's plan to go forward. Last year, opponents blocked debate on a similar measure.

Contributors: Elizabeth Finkel, Judy Redfearn, Jocelyn Kaiser, Gretchen Vogel