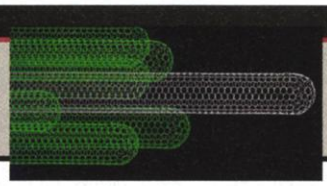

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GENOMICS

# Public-Private Project to Deliver Mouse Genome in 6 Months

Research on the mouse genome lurched into the fast lane last week, as private donors joined the U.S. government to step on the gas. A public-private consortium announced on 6 October that it's kicking $58 million into a new fund that will pay to sequence the DNA of the "black six" (C57BL/6J) strain of laboratory mouse. The consortium aims to produce a draft version of the genome by the end of February.

Scientists say the project will be a valuable tool for finding genes and other control regions in the human genome. But the venture may not thrill everyone: It will erode the exclusive position of Celera Genomics in Rockville, Maryland, which this year sequenced the genomes of three mouse strains and is selling viewing rights.

Celera president Craig Venter, who was quoted in *The New York Times* as saying that public funds would be better used on polishing the unfinished human genome, is now taking a cooler view: "I want to stress the positive," he told *Science*. The public project will "complement" Celera's work, he says, because it will focus on a mouse strain that differs from the three being sequenced by Celera (129, A/J, and DBA/2J). Venter says Celera researchers are finding an "extraordinary" amount of variation among the three strains, much more than they had expected. As *Science* went to press, Celera was planning to announce that it had completed 9 billion base pairs of mouse sequencing—three genomes at a single pass. Venter added, "I applaud the public effort" for releasing more raw data than in the past; he says this will enable Celera to improve the quality of its own database.

**MOUSE SEQUENCING CONSORTIUM**

| Sponsor | Support ($ millions) |
|---|---|
| Affymetrix Inc. | 3.5 |
| Merck Genome Research Institute | 6.5 |
| SmithKline Beecham | 6.5 |
| U.S. National Institutes of Health | 34.0 |
| Wellcome Trust | 7.75 |
| TOTAL | 58.25 |

| Sequencing lab | Director | Budget ($ m) |
|---|---|---|
| Sanger Centre | Allan Bradley | 9.8 |
| Washington University | Robert Waterston | 13.6 |
| Whitehead Institute | Eric Lander | 35 |

**Partnership.** Consortium will sequence the "black six" mouse (*right*).

The nonprofit "Mouse Sequencing Consortium," in fact, is promising an unprecedented degree of public access. It intends to release the data in real time and put even the "traces" from DNA sequencing machines in a public database within a week. The human genome project didn't go this far, although it did release results every day.

Researchers are delighted. "It's cool," says Carol Bult, head of a bioinformatics group that works on mouse genomics at the Jackson Laboratory in Bar Harbor, Maine. She predicts that, as the data tumble out, "you'll be able to do all kinds of gene hunting studies in silico," downloading mouse and human DNA from databases and comparing them. "Having the mouse really will help" make sense of how human genes function, she says.

Richard Klausner—director of the National Cancer Institute, one of the six institutes at the National Institutes of Health that pledged $34 million to this venture—says the decision to back the project reflects "the outcome of several years of discussions about the importance of the mouse sequence." It will not divert attention from the human genome, he added, as that work is supported independently by the National Human Genome Research Institute (NHGRI). The new project, he says, "gives us the ability to see what's highly conserved" in mouse and human DNA, and by comparing the two, "to define [genes] and the borders of regulatory sequences."

According to NHGRI director Francis Collins, the SmithKline Beecham (SKB) pharmaceutical company of London initiated the mouse consortium in talks beginning about 2 months ago. The company donated $6.5 million itself and helped bring in other supporters, including The Merck Genome Research Institute in West Point, Pennsylvania ($6.5 million); the DNA chip–maker Affymetrix Inc. of Santa Clara, California ($3.5 million); and the Wellcome Trust ($7.5 million), a British charity. SKB spokesperson Rick Koenig says that the company's research chief, Tadataka Yamada, felt that it was important to "pool our resources to accelerate the sequencing of the mouse genome."

CREDIT: THE JACKSON LABORATORY

## Nobel Prizes

As this issue of *Science* went to press, the Nobel Prize in physiology or medicine was awarded to Arvid Carlsson of the University of Gothenburg, Paul Greengard of Rockefeller University, and Eric Kandel of Columbia University for their work on signal transduction in the brain. The Nobel Prize in physics was awarded to Jack Kilby of Texas Instruments for his part in the invention of the integrated circuit, and to Zhores Alferov of the A. F. Ioffe Physico-Technical Institute in St. Petersburg, Russia, and Herbert Kroemer of the University of California, Santa Barbara (UCSB), for developing fast micro- and opto-electronic components. The chemistry prize went to Alan Heeger of UCSB, Alan MacDiarmid of the University of Pennsylvania, and Hideki Shirakawa of the University of Tsukuba for the discovery and development of conductive polymers. See *Science*NOW (sciencenow.sciencemag.org) on 10 October for coverage of these announcements. Full reports will appear in next week's issue of *Science*.

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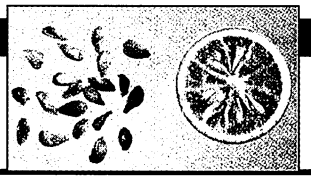

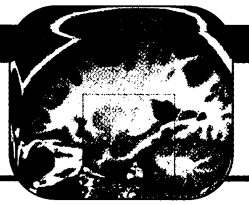

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The technical plan relies heavily on the "whole genome shotgun" method pioneered by researchers working with Venter at The Institute for Genomic Research in Rockville, many of whom followed Venter when he became president of Celera. The entire mouse genome will be chopped into pieces and cloned into bacteria, which will be "fingerprinted" and distributed to labs for sequencing. The three-pass sequencing work will be carried out by robotic devices at Eric Lander's center at the Whitehead Institute for Biomedical Research in Cambridge, Massachusetts; Robert Waterston's at the Washington University School of Medicine in St. Louis; and Allan Bradley's group at the Sanger Centre in Hinxton, U.K. All three groups have pledged to transmit raw data directly from their robots to public databases on the Internet, with no strings attached.

Even though Celera has already produced rough drafts of the genomes of three other lab mice, Bult says the new data will not be redundant. Researchers fortunate enough to have access to all four genomes, she notes, may use them to do sophisticated "dissection of complex genetic traits." By crossbreeding strains, tracking the movement of DNA, and observing the physiological effects in offspring, she suggests, researchers may learn how genes interact to regulate complex phenomena such as obesity. But at the moment, Bult can't see all those valuable mouse genomes because the Jackson lab hasn't paid for access to Celera's data.

–ELIOT MARSHALL

THE RACE FOR THE PRESIDENCY

## Gore, Bush Aides in Friendly Tussle

There are substantive differences between George W. Bush and Al Gore Jr. on science and technology policy, standard-bearers for the two candidates said during a Washington debate last week. But the genial 90-minute joust revealed a lot of similarities, too. (See page 262 for the candidates' own responses to questions posed by *Science*.)


The candidates agree on many issues, acknowledged Gore aide David Beier and Bush adviser Robert Walker. Both would double funding for basic medical research, boost spending on other civilian and military science, make the R&D tax credit permanent, and spend billions of dollars to improve elementary and secondary school math and science education.


But Walker—who heads The Wexler Group, a Washington lobbying firm, and is a former chair of the House Science Committee—pointed to industrial research as one area of disagreement. He said Bush dislikes using taxpayer funds for industry to develop emerging technologies. That concept is a centerpiece of the Clinton Administration's Advanced Technology Program (ATP), a $200-million-a-year effort that has been a perennial target for congressional Republicans. The government could better encourage companies to fund risky applied science, Walker argued, by changing tax and liability laws that currently create "too many barriers to innovation" and "an atmosphere where new ideas are threatened by lawsuits." Beier, a former executive with the biotech company Genentech Inc. who is now Gore's domestic policy adviser, defended ATP and other programs that support precompetitive industrial research. He said that Walker was drawing "an artificial distinction between [investments in] basic and applied research that sometimes doesn't serve policy-makers very well."

Beier, citing Gore's "abiding interest" in science and technology and his stints on the House and Senate committees that oversee science policy, argued that Gore's science and technology credentials are "probably better than any presidential candidate's in American history." Walker conceded that point, but suggested that his experience hasn't been put to good use. As vice president, he charged, Gore has "built government stovepipes" that have limited the flexibility and effectiveness of R&D spending programs.

The candidates' tax and education spending initiatives also came under scrutiny. Walker touted a $1 billion Bush initiative to link state universities to local school efforts to improve math and science teaching, and he also defended the Texas governor's tax proposal against charges that it would benefit only wealthier Americans. "These are the people who are investing" in technologies, such as the Internet, that are "fundamental to the new economy's growth," he said. Beier shot back that Bush "seemed to be fixated on protecting the tax status" of a small number of people. The Gore campaign also used the occasion to unveil a committee of scientists, led by Nobel laureates Harold Varmus and Murray Gell-Mann, who are backing the candidate.

Given the chance to comment, one audience member took a humorous jab at Bush's repeated reference in the first televised debate to the "fuzzy math" of his opponent. When, asked one researcher, will the candidates "stop disparaging a very productive branch of science?"

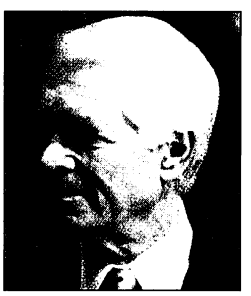
The forum was sponsored by a coalition of science policy groups and hosted by the American Association for the Advancement of Science (which publishes *Science*).

–DAVID MALAKOFF

ANIMAL WELFARE

## Research Groups Win Delay in Rules

Biomedical research groups have won a last-minute reprieve from threatened regulations covering laboratory mice, rats, and birds. In a surprise reversal, Congress voted this week to bar the U.S. Department of Agriculture (USDA) from following through on a pact with animal-rights groups to draft rules for the animals (*Science*, 6 October, p. 23). The provision, introduced by Senator Thad Cochran (R–MS), was attached to an agriculture spending bill.



**To the rescue.** Senator Cochran helps researchers.

Animal-welfare advocates were stunned by the development, which became public just as they were celebrating a federal judge's decision to approve the pact after a long-running legal battle. "We are appalled at the lengths to which some biomedical trade associations will go to avoid their legal and moral responsibilities to the welfare of lab animals," said John McArdle, head of the Alternatives

CREDIT: J. MARQUETTE/AP PHOTO