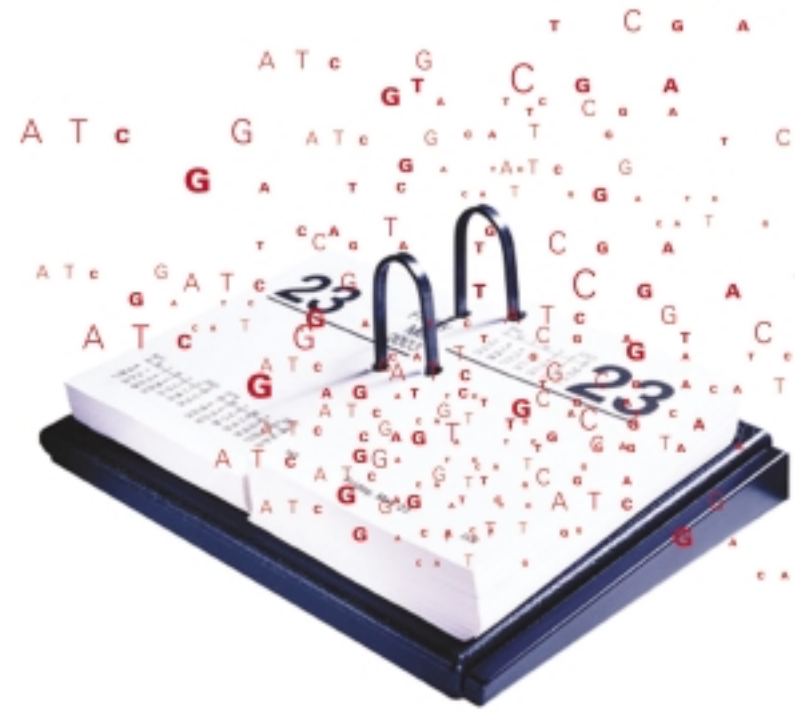
7 MILLION LETTERS, AND COUNTING

Almost 150 different genomes have been sequenced to date, including the human genome. But sequencing needs are growing faster than ever: In March 2003 the Bush administration announced it will spend $1 billion over five years to increase forensic analysis of DNA, which included a backlog of up to 300,000 samples. And the success of the growing field of genomic medicine, which promises to deliver better therapies and diagnostics, depends on faster sequencing technology.

This fall, researchers at Whitehead Institute will test new technology that could aid in these and other endeavors. The BioMEMS 768 Sequencer can sequence the entire human genome in only one year, processing up to 7 million DNA letters a day, about seven times faster than its nearest rival. Scientists began working on the project in 1999 with a $7 million National Human Genome Research Institute grant. The technology eventually will help scientists quickly determine the exact genetic sequence of the DNA of many different organisms, and could lead to faster forensic analysis of DNA gathered in criminal cases.

The heart of the new BioMEMs machine is a large glass chip etched with tiny microchannels called "lanes." It tests 384 lanes of DNA at a time, four times more than existing capillary sequencers. Each lane can accommodate longer strands of DNA: about 850 bases (the nucleic acids found in DNA, abbreviated by the letters A, C, T, or G), compared to the current 550 bases per lane.

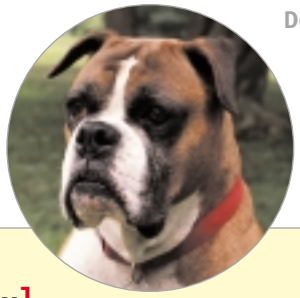


It takes about 45 minutes to read the DNA from one of the BioMEMS' 768 lanes. The machine has two chips; one is prepared as the other is sequenced, so that the machine is sequencing at all times. The new sequencer saves not just capital costs, the developers say, but day-to-day expenses as well.

"It's not only the cost of the machine, but the cost of the materials it uses," says Brian McKenna, senior software engineer at Whitehead Institute. The target, he says, is to use the same amount of consumables—liquid, chemicals, and other materials used to prepare the DNA—as existing sequencing machines. BioMEMS also uses a DNA loading process that eventually will need only 1 percent of a typical DNA sample.

While developed at Whitehead, the machine is being commercialized by network biosystems, a company in Woburn, Massachusetts, started in 2001 by Whitehead Member Paul Matsudaira, BioMEMS Labs Director Dan Ehrlich, and research scientist Lance Koutny. Shimadzu Biotech in Japan will manufacture the sequencer.

David Appell



Dog Days: A Boxer named Tasha was picked over 120 other dogs for the sequencing project.

BEST OF SHOW

It was the scientific version of the Westminster Kennel Club Dog Show. A project to sequence the genome of *Canis familiaris* (a.k.a. man's best friend) was on the minds of researchers at the Whitehead Institute/MIT Center for Genome Research, and they needed just the right dog.

120 dogs and 60 breeds under consideration. The winner: a Boxer named Tasha.

"The dog genome sequence will be a powerful basic resource that will rapidly propel the discovery of disease genes forward in both the dog and human," says Kerstin Lindblad-Toh, lead researcher on the project.

Scientists say the sequencing effort, which began earlier this year, will reveal genetic information crucial to the study of human and canine diseases. The Boxer genome has less variation than that of other dog breeds, which should make the sequence easier to assemble.