At the University of Texas Southwestern Medical Center at Dallas, human geneticist Glenn Evans is investigating just how useful various rough drafts would be. "The issue of completeness and utility has never been determined," says Richard McCombie, a sequencer at Cold Spring Harbor Laboratory in New York. "We don't know anything about intermediate sequencing products," notes Jane Peterson, an NHGRI cell biologist who oversees the human genome sequencing effort. "We have to be sure it will be useful." And the first requirement, adds Lander, is that a draft "can't impede our ability to finish."

In early September, NHGRI will evaluate the results of these efforts and decide whether to proceed with its original plan—to produce a detailed sequence over the next 6 years—or shift gears to focus on an interim rough draft. The awards announced last week (see table) are based on the original plan. They assume that the seven centers—which include all those that took part in earlier phases, except for TIGR—will be generating 117 million bases of detailed, finished sequence. If the program is refocused, next year's sequence output should be considerably higher.

That possibility pleases Evans. His team was dismayed by the prospect of being beaten to the complete genome by Venter, and he says doing a rough draft would be "a legitimate way of not being scooped." And, he adds, "it's politically the right thing to do."

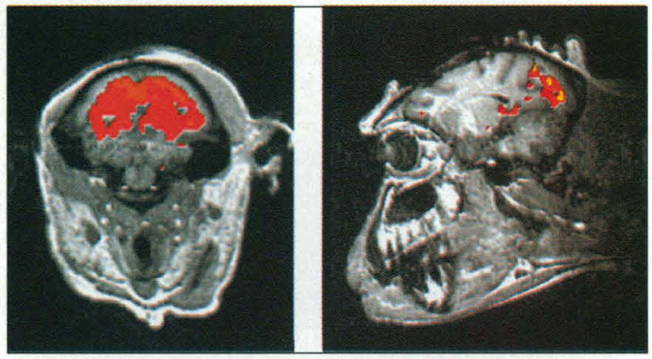
–ELIZABETH PENNISI

NEUROSCIENCE

First Images Show Monkey Brains at Work

Monkey brains have gotten plenty of close scrutiny from researchers studying functions such as perception and memory. But monkey researchers have been unable to use one promising technique: functional magnetic resonance imaging (fMRI), which maps out active brain areas and has revolutionized the study of human brain function. The problem is convincing a monkey to sit perfectly still and perform a thought task inside the claustrophobic banging magnet that creates the magnetic resonance images. Now Tom Albright and his colleagues at the Salk Institute and the University of California, San Diego, have overcome the difficulties. In the June issue of *Neuron*, they have published the first fMR images of activity in a monkey's brain. A second team, headed by Richard Andersen at the California Institute of Technology (Caltech) in Pasadena, has a similar study coming out next week in *NeuroReport*.

These successes, achieved by patiently training the monkey and designing a special seat to restrain it in the magnet, could ultimately help neuroscientists get more out of human fMR images. This noninvasive technique, based on the magnetic signal of oxygen in the blood, records the increases in blood flow that result from changes in neural activity. But what individual neurons are doing in the areas that light up on an fMR image is open to interpretation, because researchers can't stick electrodes into the brains of healthy humans. "Monkey fMRI will allow us to test our interpretations," says neuroscientist Robert Desimone, who directs intramural programs at the National Institute of Mental Health.



L. STEFANACCI *ET AL., NEURON*

Mind of a monkey. The colored patches show activity detected by functional magnetic resonance imaging in the visual areas of the brain of a rhesus monkey as it watched a children's cartoon.

The technique should also benefit traditional electrode studies of monkey brain activity. "Say I am interested in a perceptual phenomenon, but I don't have much evidence about the part of the brain that underlies it," says Albright. "fMRI gives me a way of identifying the relevant parts of the brain, which will then guide my microelectrode studies."

The first monkey fMR images, which show activation of the visual system as the animal watched a children's cartoon, don't offer any new scientific insights—just a proof of principle. To make them, both Albright's and Andersen's groups designed chairlike apparatuses made of nonmagnetic materials that hold the monkey still inside the magnet, in variations of a position Andersen describes as "sphinxlike," on haunches and elbows and looking forward, down the length of the magnet. "We worried that it would be difficult to get the monkey to cooperate," says Albright, but they found that by rewarding the monkey with juice, they were able to train it to relax in the magnet.

Both groups worked with ordinary hospital MRI machines—horizontal magnets designed to accommodate a prone human. But several labs, including those of Nikos Logothetis at the Max Planck Institute in Tübingen, Germany, and Carl Olson at Carnegie Mellon University in Pittsburgh, are working with manufacturers to develop a new generation of MRI machines specifically for monkey research. The magnets are vertical, allowing the monkey to sit upright, and have greater magnetic fields, which will increase the resolution of the images, says Andersen, who hopes to have such a facility at Caltech within 2 years.

In the meantime, Albright's and Andersen's teams are using the hospital magnets to test the relation of fMR images to neural activity in monkey brains and look for new brain areas to explore with electrodes. Eventually, Albright says, the researchers will need the better resolution—and the additional research time—available with the dedicated machines. But for now, he says, "the important thing was to show we could do it."

–MARCIA BARINAGA

DRUG DEVELOPMENT

Small Molecule Fills Hormone's Shoes

As diabetics who must inject themselves daily with insulin know only too well, a major disadvantage of protein drugs is that they can't be taken orally. Drug companies would love to find small compounds that mimic the effects of these drugs yet evade breakdown in the digestive tract. But for many protein drugs—including insulin and other hormones known as cytokines—that has seemed a forlorn hope. These proteins stick snugly to large surfaces on their receptors, and small chemicals—which might be just 1/50 of a protein's size—seemed too puny to turn on such receptors. "People didn't feel that a