WHO'S WHO

SCIENCE STARS TRY NEW ORBITS

SANTA CRUZ, Calif.—They're on the move. A host of scientific luminaries—already stars in their own galaxies—are changing orbits. Leroy Hood, W. French Anderson, J. Craig Venter, Anthony Cerami, Gerald Edelman. The list reads like a "Who's Who" of American science. There's even a Nobel Laureate in their midst. And suddenly each of these researchers has decided to relocate, switch gears, try something a little different. Does this reflect simultaneous mid-career crises? Or is it part of the "science for dollars" syndrome?

Hood

Hood—a groundbreaker in automating DNA and peptide sequencing—has finally gotten the opportunity to realize his lifelong dream. He's setting up an interdisciplinary department of molecular biotechnology at the University of Washington (UW, Seattle), a feat that would not have been possible at the California Institute of Technology (Pasadena), his former long-term home. Hood's concept of such an academic department wouldn't have worked at any other major research mecca either, not even at Stanford University (Stanford, CA) or the Massachusetts Institute of Technology (MIT, Cambridge). He checked.

Hood's dreammaker is computer-software guru William Gates III, who gifted UW with $12 million last fall. Hood's new department will bring together an unlikely—but hopefully not uneasy—assemblage of specialists: theoretical mathematicians, physicists, computer scientists, and chemical engineers. Together, they will address the demands of large-scale, automated molecular biology, a field largely created by Hood himself with his DNA synthesizers, peptide synthesizer, and gas-phase protein sequenator, to name a few of his inventions. The new group will tackle ways to develop a faster automated DNA sequencer, a large-scale DNA sequencing apparatus, genetic mapping instrumentation, and equipment for conducting rapid similarity analyses of DNA databases.

It was Hood's unique approach to human biology and medicine that excited Gates. "What appeals to me is the interdisciplinary approach of Hood's work, which draws together scientists in the medical research, chemistry, biology, and computer science areas, all working together to solve complex problems," says Gates. Hood adds, "Gates had already had some interest in biotechnology. Seattle had been trying to get him to give money for years, but he waited until he saw what he wanted."

Anderson

For Anderson—a father of human gene therapy—it came down to what his wife wanted. Anderson was at the National Institutes of Health (NIH, Bethesda, MD) for 27 years. And he would have retired there, too, most recently as chief of the molecular hematology branch of the National Heart, Lung, and Blood Institute. "I never expected to leave," says Anderson. But leaving he is, following his wife Kathryn Anderson to California, where she has been appointed surgeon-in-chief of the University of Southern California's (USC) Children's Hospital of Los Angeles. She had been acting chief of surgery at Children's National Medical Center (Washington, DC), but got

U.K. ENTERS THE FRAY

PATENTING HUMAN GENES

LONDON—Last year, the National Institutes of Health (NIH, Bethesda, MD) filed patent applications with the U.S. Patent and Trademark Office (PTO) for almost 3,000 human gene fragments, without knowing their function (*Bio/Technology* 9:1310). In July, the Medical Research Council (MRC, London) filed an application with the U.K. Patent Office for a patent on more than 1,000 fragments of human cDNA sequences from tissues ranging from the brain and central nervous system to muscle and placenta. MRC has also submitted patent applications to PTO to preserve its position should NIH obtain a decision favoring the grant of a patent.

The applications have highlighted differences in national laws over what is and what is not patentable. While most European patent laws comply with the European Patent Convention (EPC), there is no harmonization between Europe and the U.S. Patent discussions on harmonization are under way under the auspices of the World Intellectual Property Organization (Geneva).

The U.K. Patent Office's decision on MRC's application is unlikely to be available for some time. But the arguments before it seem likely to focus in three main areas: the discovery/invention dichotomy, morality, and industrial applicability.

Discovery or invention

The seemingly narrow distinction between a discovery and an invention is crucial in U.K. law, which precludes patents that relate to discoveries as such. U.S. patent law, for its part, allows patents on discoveries.

The dichotomy between discovery and invention was discussed at length by the English Court of Appeal in the Genentech vs. Wellcome tissue plasminogen activator (t-PA) case. Appeal Judge Lord Justice Purchas quoted with approval the following statement: "It is trite law that you cannot patent a discovery but if, on the basis of that discovery, you can tell people how it may be usefully employed, then a patentable invention may result. This in my view would be the case even though, once you have made the discovery, the way in which it can be usefully employed is obvious enough."

In essence, that judgment established that the mere cataloging of gene and protein sequences that previously existed in nature was a "discovery" and, therefore, not patentable. However, the possibility of a practical application of the discovery—the production of commercial levels of t-PA—transformed the discovery into a potentially patentable invention, even though the application was obvious once the sequences had been discovered. Patent Office examiners are, of course, obliged to follow the Court of Appeal's dicta. To grant the patent, they must believe that particular cDNAs have a practical application.

Morality

On the question of morality, U.K. patent law states that "patents shall not be granted for an invention, the publication or exploitation of which would be generally expected to encourage offensive, immoral, or anti-social behavior." Since this position is closely aligned with the "morality provisions" of the EPC, the European Patent Office's (EPO) recent consideration of the "morality" of the "Harvard Mouse" may have a bearing on the MRC applications.

Many people will argue that obtaining human gene patents equates to the obtaining of a monopoly on a part of life itself and, therefore, must be morally unacceptable. But in considering

passed over for its chairmanship.

Anderson intends to set up a gene-therapy research institute at his new home, the USC School of Medicine's Norris Cancer Center, where he will be a full professor with joint appointments in biochemistry and pediatrics. The operating expenses of Anderson's laboratory will be underwritten by a grant to USC from Genetic Therapy, Inc. (GTI, Gaithersburg, MD). The relationship between Anderson and GTI stems from their joint participation in federal Cooperative Research and Development Agreements, with Anderson acting as NIH's principal investigator.

"Any university would be delighted to have French," comments M. James Barrett, GTI's president and chief executive officer. "This gives him a quick start." The details of the grant have yet to be worked out, according to both Anderson and Barrett. Generally, however, the grant will run to "several million per year over a 5 to 10 year period," says Anderson. He says that one of his objectives is to "develop a particle-injectable vector. If I do this on GTI funding, GTI will get the licensing rights."

Venter

Also bailing out of NIH is Venter, whose new method for quickly sequencing fragments of human genes has opened a Pandora's box of patenting issues both at NIH and in biotechnology in general. Although Venter's technique is potentially capable of identifying thousands of human genes a month—and perhaps, according to Venter, as much as "50 percent of the human genome" over the next few years—NIH can't come close to coughing up the funds necessary for such a substantial undertaking. But there's private money begging for the chance. While entrepreneur Frederick Bourke couldn't convince Venter to jump ship, the venture-capital firm Healthcare Investments Corp. (HIC, Edison, NJ) did, to the tune of $70 million.

Venter's being set up as head of the new not-for-profit Institute for Genomic Research (Germantown, MD). He's brought along most of his staff from the National Institute of Neurological Disorders and Stroke, as well as his wife, Claire Fraser, who headed the molecular and neurobiology lab at the National Institute on Alcohol Abuse and Alcoholism. Venter's method employs what he terms "expressed sequence tags" to sequence random segments of DNA. He has already found pieces of about 10,000 genes. At the new facility, he expects to sequence as many as 2,000 genes a week, a pace eight times as fast as that at NIH.

Betting that at least some of these new sequences will lead to the development of therapeutic or diagnostic products, HIC set up the company Human Genome Sciences, through which it is funding the institute and to which will go all rights to the institute's potential products. But Venter insists that all data garnered will be available to NIH and the research community. "Scientists at the institute and the company will freely publish the results of their scientific investigations," he says.

Cerami and Edelman

Another venerable research haven, Rockefeller University (New York), is losing some headliners of its own. as long-timers Cerami and Edelman are off to new ventures.

Cerami—a 22-year Rockefeller veteran who pioneered work with tumor necrosis factor—relocated most of his lab personnel to the Picower Institute for Medical Research, a facility associated with Northshore University Hospital (Manhassett, NY), which Cerami now heads. Philanthropist Jeffry Picower funded the new institute to the tune of $10 million, initially. Picower says that he "anticipates that the endowment will exceed $100 million over the next five years."

For Cerami this was a "unique opportunity" to conduct research that will "directly address the need for new medical cures," according to Picower. For instance, Cerami and colleague Andrew Slater reported in January the molecular means by which the antimalarial drug quinine works—when it works—to kill the dreaded parasite. The discovery may eventually lead to new antimalarial drug strategies.

And Nobel laureate Edelman—a pioneer in brain biology—has traded a view of New York's East River for a view of the vast Pacific Ocean. If that weren't enticement enough, Scripps Research Institute (La Jolla, CA) gave Edelman a department of neurobiology and a new building to house the Neurosciences Institute (NSI), an independent body that has been roosting at Rockefeller since 1981. Needless to say, most of those allied with Edelman's lab and with the NSI are now in California, too.

Although Edelman still plans fund-raising ventures to support NSI's mission to develop biologically based theories of brain function, other members of the stellar elite mentioned here are finally free of that chore.

—Jennifer Van Brunt

the "morality" of the "Harvard Mouse," EPO weighed the suffering of animals and the possible risks to the environment on the one hand with the invention's usefulness to mankind on the other. EPO decided that the "oncomouse's purpose of facilitating cancer research and treatment was of paramount importance for the welfare of mankind." Similar considerations may apply for MRC's cDNAs.

Whether it is appropriate for patent examiners and lawyers to decide morality questions at all raises a legal issue that should be addressed by legislation, says David Owen, MRC's director of industrial collaboration and licensing. A new moral judgment has to be made for which the law in the U.K. provides little guidance.

Industrial applicability

A U.K. patent can be granted only for an invention that can be applied industrially, meaning that "it can be made or used in any kind of industry, including agriculture." The requirement of industrial applicability had no direct counterpart in U.K. statutes before the 1977 U.K. Patents Act, and judicial views on its meaning are therefore limited.

Specific functions of most of the genes for which the MRC patent applications have been made remain unknown. That does not make it easy to argue that industrial applicabilitity exists. Those making the applications will, no doubt, argue that virtually every gene identified will at some point in the future have practical utility in research, either as a genetic probe or as a marker. Both the U.S. and the U.K. patent examiners will have to decide whether that is sufficient to satisfy the requirement. The issue of industrial applicability is likely to prove the most testing obstacle to patents on human gene fragments.

One possible outcome of the deliberations in the U.S. and U.K. is that only one of the patent offices may conclude that patents should be granted. If the PTO says "yes" while patent offices in Europe do not, then the European biotechnology industry could find itself at a considerable disadvantage.

PTO is likely to pronounce on the cDNA patent applications before the U.K. The pressure will then be on MRC to decide how it will respond. MRC's Owen has made it clear that MRC feels that nobody should have patent rights on gene sequences of unknown function. Indeed, MRC's desired outcome is that none of the gene patent applications be granted. Should the NIH patents be granted, however, then MRC feels that its own applications will equip it to participate in discussions to prevent assertion of patent rights.

—Gary Moss and Simon Cohen

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