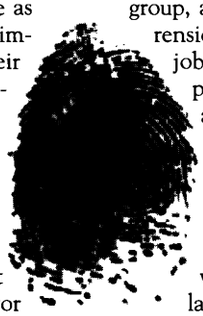
Philip Reilly, a lawyer and geneticist at the Shriver Center for Mental Retardation in Waltham, Massachusetts, the Lander camp held sway, and early drafts of the statistics chapter were very conservative. In fact, two committee members were so disgruntled that they leaked an early draft of the statistics chapter to FBI scientist Bruce Budowle, prompting outraged letters from his boss, John Hicks, director of the FBI's crime laboratory. Having Lander coordinate that chapter is like having "the fox guarding the hen house," Budowle complained to *Science*.

The final product, committee members agree, is a more moderate one that they all could live with. The evolution came not from a change in politics or external pressure as sometimes alleged, the members say, but simply from new data that emerged during their deliberations. In the final version, the committee does assume that population substructure exists, as the cautious camp argues, but they devised a "practical and sound" approach for accounting for it: using the multiplication rule, but in combination with what they call the "ceiling principle." This, they say, will ensure that the frequency estimates are biased in favor of the suspect.



It would work this way. First crime labs must establish the ceiling, or upper bound, frequency for each allele at each site in 15 to 20 genetically homogeneous populations, such as English, German, Russian, Vietnamese, and Puerto Rican. This would be done by collecting blood samples and establishing cell lines from 100 individuals in each population. When it comes time to calculate the odds of a match, the lab would use the highest frequency found in any of the populations, or 5%, whichever is higher. Collecting the samples should take about a year and cost about $1 million, says McKusick. In the interim, the group recommends a shortcut—using the highest frequency found in any of three major population groups in the United States, or 10%, whichever is higher.

The end result, says study director Oscar Zaborsky, is that the most "extravagant" probability estimates will be replaced with numbers in the range of 1 in several hundred thousand or a million. "It tones down the hype but will still be useful." Lander agrees: "It is sufficiently conservative, yet sufficiently usable. I don't think anyone would fight it."

In a number of far less contentious recommendations, the committee came out strongly in favor of mandatory accreditation of DNA typing labs and mandatory proficiency testing. The problem, the committee says, is that this new technology burst on the scene so rapidly that there are essentially no standards and no regulation—a disturbing prospect since the largest potential source of error lies in poor laboratory practice. The group urges Congress to adopt legislation requiring accreditation of all DNA typing labs, and recommends that the courts allow DNA evidence to be admitted only if the laboratory has been accredited. They delegate the task of setting up the program to the Department of Health and Human Services, in consultation with the Department of Justice—but not to Justice directly, as one bill before Congress now suggests.

Nearly everyone on both sides of the legal debate agrees that the current procedure for vetting new technologies—a string of interminable pretrial admissibility hearings—is not the way to go. To avoid these expensive courtroom fights in the future, the committee calls for the establishment of an ad hoc expert group, a National Committee on Forensic DNA Typing, whose primary job would be to evaluate new approaches. This committee should also oversee the collection of blood samples for the population studies, says the committee, and advise the courts on statistical questions as well. As they see it, the committee would be composed of molecular geneticists, population geneticists, ethicists, and lawyers, and would be housed in the National Institutes of Health or the National Institute of Standards and Technology, with support from the National Institute of Justice and the National Science Foundation.

The committee clearly hopes its new report will be the final word. And to McKusick, the fact that this disparate group was able to reach a consensus bodes well for the report's reception.

The committee's hard-earned compromise drew a tepid response from the FBI, the major practitioner of DNA typing and one of the report's sponsors. It's no secret that the FBI hated the November 1991 version that was leaked to them, which Budowle blasted as a "tainted document" that was skewed to the defense. But in another hastily called press conference on 14 April, Hicks said the bureau is "pleased with the report," although when pressed he wouldn't endorse it.

Nevertheless, the last-minute revisions of the report seem to have ameliorated most of the FBI's concerns. And that could be good news for everyone. Says committee member Reilly: "Tactically, it is unwise for them to oppose the report. It could cost them in court. If the FBI can live with it, this would close the door on much of the criticism from the defense side."

–Leslie Roberts

HUMAN GENOME

Why Watson Quit as Project Head

As predicted in last week's *Science*, James Watson has resigned as head of the genome effort at the National Institutes of Health (NIH). The resignation comes in the wake of a long-running feud with NIH director Bernadine Healy, punctuated by recent charges—and denials—of financial conflict of interest.

Watson resigned on 10 April, saying simply that, "Having accomplished this goal of launching the project, the time has come for me to step down." In a statement accepting his resignation, Healy replied: "Dr. Watson is an historic figure in the annals of molecular biology, and the National Institutes of Health has benefited from his leadership." Yet those carefully crafted words belie the tensions and animosity that led to Watson's departure. *Science* spoke with both Watson and Healy about the events leading up to the split. As will come as no surprise to their friends and colleagues, their versions are miles apart.

Rumors spread the first week in April that Healy had fired Watson over the alleged conflicts—his investments in several biotech firms including Amgen Inc. and DuPont-Merck Pharmaceuticals. Healy denies that, insisting that the two never discussed possible conflicts of interest until Watson resigned. But Watson, his friends, and his lawyer tell a different story. They maintain that Healy alleged conflict of interest to force Watson out because of his vehement criticism of her policies—specifically, NIH's attempt to seek patents on thousands of gene fragments (*Science*, 11 October 1991, p. 184). So while Healy's denial may be accurate, says Watson, she is splitting hairs: "She created conditions by which there was no way I could stay."

As Watson tells it, the patenting episode boded disaster right from the start. He was offended because Reid Adler, the director of technology transfer at NIH, filed the application—presumably with Healy's blessing—without bothering to inform him, even though it had major ramifications for the Genome Project. And Healy was clearly enraged when Watson began denouncing the plan as idiotic and destructive to the project, the biotech industry, and international relations. Faced with a groundswell of criticism here and abroad, Healy summoned Watson to her office last fall and told him to keep his criticisms "within the family." Since then, claims Watson, Craig Venter, the NIH researcher whose lab isolated the gene fragments, has become Healy's adviser on the Genome Project, while Healy made it very

clear she wanted Watson out. In fact, says Watson, the patent dispute underlies everything that happened since.

The current allegations revolve around two related events: a routine review of Watson's financial records, and complaints about Watson made by financier Frederick Bourke. Since Watson took the NIH post in 1989, he has openly declared all of his holdings each year, as required. And each year, NIH officials have signed off on them, declaring there is "no conflict noted," says one of his lawyers, Randy Moss of Wilmer, Cutler, and Pickering in Washington, D.C.

Holdings questioned. Last June, though, Jack Kress, the special counsel for ethics in the Department of Health and Human Services (HHS), called Watson in with some questions about his biotech holdings and how he recuses himself from decisions involving companies in which he owns shares, or Cold Spring Harbor Laboratory, where Watson is still the director. After a lengthy discussion, Kress told Watson he would get back to him if there was any problem. Watson says he heard nothing until Kress summoned him back for another chat on 24 March.

But then, Watson says, the writing on the wall became unmistakably clear. First they discussed one instance in which Watson had inadvertently failed to recuse himself from a decision involving a minor grant to a company in which he has an interest. Then, says Watson, Kress "raised the issue of whether my holding shares in biotech or pharmaceutical companies was compatible with having a policy on cDNA [gene fragment] patents."

And it was in Kress' office that Watson first saw a letter that financier Bourke had written complaining about him to Healy. Watson and Bourke had gotten into a shouting match a couple of months earlier when Watson learned that Bourke was trying to snare two stars of the genome project—Robert Waterston of Washington University and John Sulston of the Medical Research Council in England—for a sequencing company he was planning to start in Seattle. And in typical Watson fashion, he minced no words in denouncing the plan (*Science*, 7 February 1991, p. 677).

After their fight, an irate Bourke wrote to Healy, "saying damaging things about [Watson] and raising ethical concerns," Healy says. *Science* has not seen the letter, but sources say Bourke blasted Watson for interfering with his legitimate business activities. In addition, he specifically charged that Watson had approached Glaxo, the British pharmaceutical giant in which Watson's family owns some stock, and suggested that the company intervene in some way to keep Sulston in England. (Bourke did not return phone calls from *Science*.)

Bourke aside, Watson recalls that Kress said he saw no reason why he could not keep his job. In an interview with *Science*, Kress reiterated that Watson had done nothing unethical or improper. "I don't want people spuriously accused of unethical behavior when there is absolutely no truth to it."

But Watson told Kress he wanted out. "I realized I was in too hot of a position and I should just resign." To Watson, Healy's handling of the letter was the final insult. "The letter was written in February but I never saw it until last week [24 March] in Kress' office. I think Dr. Healy should have sent it to me. That led me to think that the sooner I left the employ of Dr. Healy, the better."

Watson's only question was when to leave, since NIH was just beginning its appropriations hearings. Kress said he would talk to James Mason, the assistant secretary for health. That night, Watson began telling his colleagues that "my position had become untenable." At the same time, Healy told *Science* that she had "serious concerns" about Watson's financial arrangements.

Watson got in to see Mason on 9 April and resigned the following day. He sees the entire episode as a blatant campaign to smear him. "I find it sordid, awful, and very depressing," he says. "The whole thing is sickening."

But Healy dismisses Watson's account as "totally incorrect." "He knew about the cDNA patent long before I did and never told me," says Healy, who maintains that she did not learn of the application until the fall. "The first thing I did was call him and say, 'What is this?' We had a good discussion." Watson's claims to the contrary, says Healy, their policy dispute over the patent application has "absolutely no bearing" on the current issue. "It is a matter of financial conflict of interest" that goes back well over a year, she says.

She says her concerns were triggered by phone calls from Bourke and molecular biologist Leroy Hood of the University of Washington, who is one of Bourke's advisers in the sequencing venture, and then by Bourke's subsequent letter, which she forwarded to the HHS ethics office. She did not show Watson the letter, she says, because Mason told her "the problem would be handled by them, not by me."

Faced with allegations of impolitic, if not unethical behavior, Healy did ask Kress to take another look at Watson's financial holdings to be sure everything was in order, says her spokeswoman, Johanna Schneider. To Healy, it didn't seem to be. "There may indeed be apparent if not real conflicts of interest," she says.

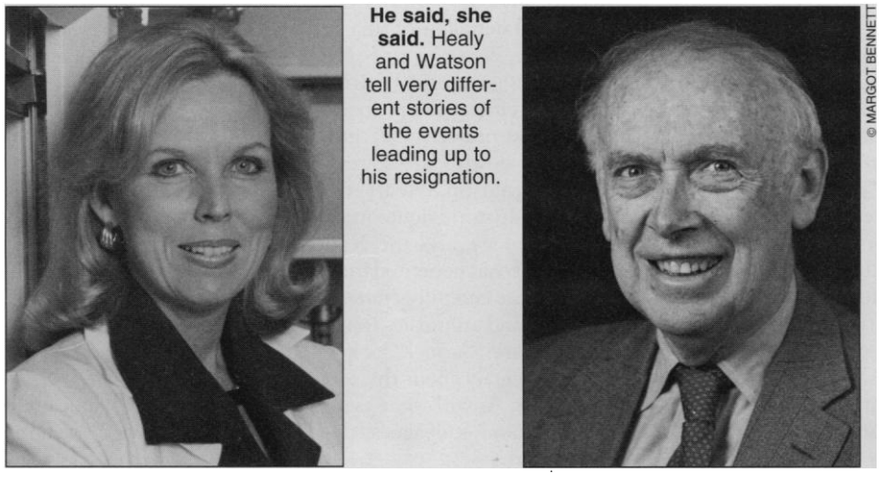
Now that Watson has resigned, the questions about his financial arrangements are largely moot. But that leaves the larger matter of what his departure portends, both for Healy and for the Genome Project.

Resignation a travesty. As to Healy's reputation, both with the scientific community and with Congress, where Watson has always been viewed with great respect, that will depend on which version of the story people believe—hers or his. Among the genome community, at least, it's clear which view will prevail. "The resignation of Jim Watson is a tragedy and the result of a travesty," says Norton Zinder of Rockefeller University. "It was his talents and will that led the Genome Project to an ongoing but still fragile reality."

As for the project, which has been under attack almost since its inception, it will need a leader, not just a bureaucrat, to chart its ambitious course and to defend it before Congress. Zinder and other genome experts think it will survive—provided Healy can attract someone of sufficient stature.

The looming question, then, is who will take Watson's place. Healy moved quickly to appoint Michael Gottesman of the National Cancer Institute as acting director, but he does not intend to stay. Johns Hopkins molecular biologist and Nobel laureate Dan Nathans is already being mentioned as a possibility, though he dismisses such talk as "nonsense." Watson, for one, is worried. "I don't know how to get someone to succeed me. I don't know anyone who doesn't have stocks. And I don't know anyone who would want to live with my boss."

–Leslie Roberts



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He said, she said. Healy and Watson tell very different stories of the events leading up to his resignation.