EUROPEAN SCIENCE POLICY

France Rebels Against Gene-Patenting Law

PARIS—France is on a collision course with the European Union over an E.U. directive that many researchers believe would allow raw DNA sequences of human genes to be patented. On 7 June, French justice minister Elisabeth Guigou told the National Assembly that the directive—which must be enacted by each of the 15 E.U. member nations by 30 July—contradicts French bioethics laws, which forbid the patenting of any part of the human body. If France maintains its defiance, it could be fined up to $600,000 daily for each day it refuses to adopt the directive. But the controversy may not be just another example of French pique: No E.U. country has yet adopted the directive, and two have mounted a legal challenge—although France is the only nation so far to hint that it might not toe the E.U. line if the legal maneuvers fail. Bolstering the French position is an Internet petition campaign against the law, which has gathered more than 4500 signatures, mostly from researchers and clinicians.

The directive must be enacted by member states within 2 years of its adoption on 30 July 1998. One section would appear to ban the patenting of DNA sequences, stating that "the sequence or partial sequence of a gene" cannot be patented. But subsequent wording declares that "an isolated element of the human body ... produced by a technical process," including a gene sequence, can be patented "even if the structure of this element is identical to that of a natural element."

The latter provision, critics say, would seem to allow anyone to generate a human gene sequence and patent it without having to demonstrate its usefulness as an invention—say, as the basis for a drug. Axel Kahn, a geneticist at the Cochin Institute in Paris, argues that this wording could drive Europe into the same patenting frenzy that exists in the United States, where often tenuous claims of usefulness underlie efforts to try to put a lock on thousands of human genes (*Science*, 18 February, p. 1196).

As an example of the potential consequences of the E.U. directive, an 8 June opinion by France's National Consultative Committee on Ethics backing the government's position cited a patent on the human gene coding for CCR5, a cell membrane receptor for certain immune signaling molecules. The patent was awarded in February to U.S.-based Human Genome Sciences Inc. Company officials have claimed that the patent covers use of CCR5, which serves as a coreceptor for the AIDS virus, to develop anti-HIV therapies even though the firm was unaware of the protein's role in HIV when it applied for the patent (*Science*, 25 February, p. 1375).

That sort of sweeping claim appalls the directive's critics. "We absolutely must make a distinction between discovery [of a gene sequence] and invention [based on that sequence]," says French National Assembly deputy Jean-François Mattei, a pediatric geneticist who helped launch the petition drive last April (www.respublica.fr/sos.humangenome/index1.htm). Prominent French scientists such as Nobel laureates Jean Dausset and François Jacob have signed the petition, which calls for an "immediate moratorium" on the law's adoption to allow for its "renegotiation."

E.U. officials defend the law, which they argue is not at all ambiguous. A "technical procedure" that allows a sequence to be produced "outside the body, in a way nature cannot do itself ... is patentable," says Jonathan Todd, a spokesperson for the E.U.'s internal market directorate. Guigou's finding that the directive is incompatible with French law is irrelevant, Todd says: "[E.U.] law takes precedence over national law." Also taking umbrage with opponents is France Biotech, an industry group that warned last week that failure to adopt the directive would "have disastrous effects" by leaving the genome field free to France's competitors, particularly those in the United States. Pascal Brandys, president of the French biotech company Genset, told *Science* that the distinction between a discovery and an invention insisted upon by critics "is not recognized in patent law. ... This type of black-and-white definition is too simplistic."

The law's opponents are hoping France will convince its E.U. partners to rewrite the directive when it assumes the union's presidency on 1 July. They're heartened by the actions of Italy and the Netherlands, which are now challenging the directive before the European Court of Justice. But if these efforts bog down, says Todd, the European Commission may launch proceedings against France or any other E.U. member state that has not passed the law by 30 July. **–MICHAEL BALTER**

RESEARCH POLICY

Report Tracks Federal Funding in Each State

Maryland is the most research-intensive state in the country, according to a new report* that describes in unprecedented detail where the federal government's annual $80 billion research budget is spent. The state's concentration of national laboratories and government contractors puts it second in total dollars received and far above California, Massachusetts, and other better known technology heavyweights in per capita federal R&D spending. That ranking is one of many facts in a 650-page tome by RAND's Science and Technology Policy Institute in Arlington, Virginia. Its authors hope the report will raise public awareness about research as well as inform politicians.

"It's hard to translate federal R&D into terms that members of Congress and the public can understand," says lead author Donna Fossum, referring to the typical categorization by funding agency rather than recipient. "We decided that a state-by-state breakdown was the most manageable format. It also provides an answer for lawmakers who ask, 'What's going on in my district?' "

The report comes out just as several states, suddenly flush with budget surpluses, are pouring money into research as a way to stimulate their regional economies. "I think this information can be very useful for governors who want to leverage federal funding, or to fill in gaps," says Tom Robel of the National Governors Association. Adds Dan Berglund, executive director of the State Science and Technology Institute in Columbus, Ohio, "it contains tremendously useful information that I've never seen before. In fact, we hope that the next Administration will decide to make this an annual report." **–JEFFREY MERVIS**

WHERE R&D RULES ...

State	R&D's share of all federal funds	Total federal R&D investment	R&D funds per capita
Maryland	34%	$8.1 billion	$1573
New Mexico	29%	$2.3 billion	$1328
Georgia	26%	$4.4 billion	$580
Alabama	23%	$2.3 billion	$541
Rhode Island	22%	$0.5 billion	$521
Massachusetts	22%	$3.6 billion	$587
California	19%	$14.4 billion	$441

...AND WHERE IT DOESN'T

Puerto Rico	1%	$58 million	15
Kentucky	1%	$112 million	29
South Dakota	2%	$39 million	53
Maine	2%	$79 million	63
Oklahoma	2%	$164 million	49
South Carolina	2%	$204 million	53

SOURCE: RAND, 2000

* Discovery and Innovation: Federal Research and Development Activities in the Fifty States, District of Columbia, and Puerto Rico (www.rand.org/publications/MR/MR1194).