more concerned about due credit than money.

Another possible problem centers on an article published by the *New Scientist*, which described in rough outline conference lectures delivered by Boyer about his plasmid work. The problem could affect both the process patent already issued and the second application.

The law requires that a patent application be filed within one year after an invention is publicly disclosed or published. The *New Scientist* article was published in 1973, a year and one week prior to the filing date of Cohen and Boyer's first patent. The scientists filed their second patent claim in 1978.

The patent office raised two matters related to the *New Scientist* story: whether the article was enabling and whether the lectures publicly disclosed Boyer's work for which he later sought a patent. Rowland contended that, at the time the article was published, important steps in the experiment had not yet been developed. Furthermore, the key plasmid in the experiment was not available to others at the time. He said the Boyer's talks did not constitute public disclosure because the participants at the meeting pledge in advance to hold all discussions in confidence.

In the short term, Stanford and the University of California have more at stake with the patent issuance than licensing companies. A market analyst for Sutro and Company, M. Kathy Behrens, said that if the claim is rejected, then the universities may have to pay back the royalties already received. Industry, however, is only paying nominal fees for licensing and royalties, she said.

Market analysts and lawyers seem to agree that even if the second application is issued, the universities are not home free. Once companies begin to market widely commercial products derived from genetic engineering, their outlays for royalties will jump significantly. One lawyer said that the companies may then find it more attractive to challenge the patents.

The same lawyer predicted that the "hard-nosed chemical companies" would be the most likely sector of industry to sue over the patents. Biotechnology firms and pharmaceutical companies are less likely to take the universities to court because they have long-standing ties to academia that they would prefer not to strain. The lawyer suggested that it is probably no coincidence that the large chemical firms, such as Exxon, which are now venturing into biotechnology, have not taken out a license on the Cohen-Boyer patent.—**MARJORIE SUN**

Global Energy R & D Stalls

Paris. The rapid world-wide growth in government-sponsored energy research that characterized virtually the whole of the 1970's has come to an end, dragged down largely by reduced efforts in the United States. The total budgets devoted to such activities in the major Western countries remained virtually constant between 1980 and 1981, according to figures just published in Paris by the International Energy Agency (IEA) of the Organisation for Economic Cooperation and Development (OECD).

The outcome was predictable from the trends of the past few years. Energy research spending by the 23 members of the IEA (which includes all the major OECD members apart from France) increased by 14 percent between 1977 and 1978, by 11 percent in 1979, and by only 6 percent in 1980. The drop to level funding in 1981, however, was almost entirely due to the cuts made by the Reagan Administration in the research budget of the U.S. Department of Energy. Energy R & D in the United States accounts for almost half (48 percent) of the total spent by the countries covered in the IEA report.

Furthermore, the drop in overall research funding would have been even greater if several other OECD countries, particularly those hit hardest by the rapid rise in oil prices in 1979 and who lack a significant indigenous supply of energy resources, had not reported significant increases. In West Germany,

Conservation and solar R & D are shrinking while nuclear research is expanding.

for example, spending on energy research increased by 11 percent in real terms between 1980 and 1981, in Japan by 10 percent, and in Italy—reflecting a major new commitment to research in both conventional and unconventional sources of energy by the Italian government—by a massive 76 percent.

The same three countries figure at the top of those spending the most on energy research as a proportion of gross national product, headed by Italy at 0.152 percent. Japan tops the list when it comes to comparing expenditure on energy research to total primary energy demand, with a figure of $4.21 per tonne of oil equivalent, compared to $2.08 in the United States.

A slackening in the growth of the price of oil after 1979—and the reduction in the role of the U.S. government in sponsoring energy research introduced by the Reagan Administration on the grounds that private industry should shoulder more of the responsibility—is reflected in a significant overall drop in the amount of money devoted to research in conservation. For the 23 countries covered by the survey, the total invested in conservation R & D dropped for the first time since data began being collected, falling from $562 million to $496 million.

In contrast, total spending on conventional forms of nuclear energy research continued to increase, climbing by over 10 percent between 1980 and 1981—with the most significant increases occurring in Italy (50 percent increase), Japan, and the United States. As for research into advanced nuclear energies—primarily fast breeders and fusion technology—total funds dropped slightly, mainly reflecting reductions in the U.S. and U.K. budgets from $2.205 billion in 1980 to $2.170 billion, although here again there were large increases in the efforts of both Italy and Japan.

Not to be put off by this drop, however, the report, prepared under the auspices of the IEA's Committee on Energy Research and Development chaired by Donald M. Kerr, director of the Los Alamos National Laboratory, has some enthusiastic words for advanced nuclear research. It points out that funding for breeder technology accounts for 17.6 percent of the total amount of energy research supported by the countries covered in the report, and describes this as "a remarkable commitment to the future of nuclear energy" which "reflects the belief that no alternative technology can currently hold the same ultimate potential."—**DAVID DICKSON**

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