squeeze on mathematicians became evident. Teaching loads increased by 60 percent so that a mathematician in a research institution now teaches two or three courses a semester. Graduate students could no longer get a respite from teaching in order to concentrate on their research for even a semester. "Graduate students have to teach in order to live," says Heini Halberstam, head of the mathematics department at the University of Illinois. At Illinois, graduate students in mathematics teach 6 hours a week one semester and four hours a week the next. Of the 200 graduate students, about ten each year get the luxury of a semester off from teaching.

Yet, says Hoffman, mathematicians did not complain very loudly because many of them could still do their research. "In a theoretical area, cutbacks in graduate student research or support don't get the same reaction as they do in an experimental field where graduate students are needed to do research," he remarks. As money got tighter, Hoffman says, "There were fewer postdocs, fewer visitors. People kept thinning out their grants, cutting out research associates and visiting scholars until in 1980 the average NSF grant was $2000 for 2 months of summer research. And this was for the most distinguished scholars." At the same time, says Hoffman, mathematicians were faced with overwhelming teaching burdens as enrollment in undergraduate math courses kept increasing, due in part to the popularity of computer science and engineering majors. With no additional money, the math departments could not hire new faculty members.

Other sciences also had financial difficulties but, Hoffman notes, "These problems could be dealt with in other fields because money could be shifted. Mathematicians had nothing to shift. Their NSF grants were used almost entirely for summer salaries." Hoffman contends that the desperate financial straits of mathematicians should be obvious even to the casual observer. "You can walk into the math department at any major university and you can detect a markedly different level of support," he says. "Secretarial help doesn't exist. There is a complete absence of postdocs. Graduate students are all teaching assistants."

One reason this situation continued, according to Hoffman, is that mathematicians traditionally have not been politically astute. "There has been a lack of political cohesion. A lack of awareness of how to operate politically is part of the problem," he remarks. In addition, Hoffman says, some mathematicians had a disdain for the very idea of competing for government funds.

Now, Hoffman says, the situation is changing, in part because it has become so intolerable that even the politically reticient mathematicians are being forced to speak up and in part because the committee's report documents such an astonishing case of neglect of math research. "There has been a real movement," Hoffman says. The mathematicians, "have a pretty powerful case." The committee recommends that the federal government increase its spending for mathematics research from the current $80 million a year to $180 million a year over the next 5 years—an increase of 18 percent a year. "We are asking for more support for graduate students and postdocs and for more research support," committee chairman David says. "Equity is not the issue. The issue is, Is there enough math to balance work going on in the other sciences? Our answer is that math is in a poor state of health and needs help."—**GINA KOLATA**

France's New Technocrats

A cabinet reshuffle has put strong supporters of science and technology in three important posts

Paris. In reshuffling his cabinet in mid-July, French President François Mitterrand has dealt a new hand to the research community, with some unexpected cards in it.

By selecting the former minister for industry and research, Laurent Fabius, as his new prime minister, President Mitterrand has shown his determination to give the third government under his presidency a firm technocratic stance. The 37-year-old Fabius, a long-time protegé of the president's, has lost few opportunities since being appointed to the cabinet last year to state his faith in high technology as the key to economic success and his belief in the rapid modernization of French industry.

This impression is confirmed by Fabius's decision to appoint as his successor at the ministry Hubert Curien, previously the president of France's space research agency, the National Center for Space Studies (CNES). Curien was one of the principal guiding lights behind the successful development of the launcher Ariane, now firmly established as a commercial competitor to the U.S. space shuttle.

A surprise decision, however, has been the reinstatement of Fabius's own predecessor at the ministry, Jean-Pierre Chevènement, into the French cabinet as the new minister of national education, a post which includes responsibility for both schools and universities. Chevènement, the leader of a left-wing group within the Socialist party, resigned in March 1983 in protest at the government's economic policies, and has since remained a fierce critic of some of the directions Mitterand has been taking.

As a flamboyant and outspoken minister of research and technology, appointed by Mitterrand immediately after the Socialist victory in the general election of 1981, Chevènement won considerable support from an initially skeptical scientific community. This was primarily a result of his success in obtaining greater political visibility for science, and in particular for securing a substantial increase in the civilian research budget, which rose from 1.8 percent of the gross national product in 1980, the last year of the previous administration to 2.15 percent in 1982.

He enjoyed less success, however, when Mitterrand added responsibility for industry to his ministerial brief. Chevènement's commitment to a strong interventionist role for the government, although generally acceptable as a strategy for funding research programs, met with increasing resistance from the heads of many of the country's nationalized industries.

Fabius, who significantly reversed the title of the post to minister of industry and research when he took over the position, has frequently insisted that, despite the general financial austerity

which has made it necessary for the government to cut back on some of its promises for continued increases in the science budget, he was still giving research "an absolute priority."

Speaking at a meeting organized by the National Center for Scientific Research (CNRS) in Paris last month, for example, Fabius said that although the government did not now expect spending on research and development to reach 2.5 percent of the gross national product next year—a goal which, with some provisos, it had enshrined in a law passed in the summer of 1982—nevertheless, he expected this target to be reached in the next few years. After that, he said, "France should progressively approach 3 percent."

Fabius has also been keen to widen the international horizons of the French research community. As chairman of the Council of Research Ministers of the European Economic Community for the first 6 months of this year, he presided over the successful launching of a $1.3-billion information research program called ESPRIT. He also paid a 4-day visit to Japan in early July to discuss possibilities for closer technological and scientific collaboration.

However, both personal ideology and the pressure of recent events, such as the crisis in the steel industry, have led Fabius to spend most of his time on the industry side of his brief. This forced him to give greater attention to government measures designed to stimulate industrial research, either through direct support or, following recent trends in other Western nations, through measures designed to encourage greater investment in research by the private sector. But it also led to recent mutterings from the scientific community that its needs were being increasingly neglected in top political circles.

This situation may improve under the new arrangements, since responsibility for industrial problems is now being moved to a separate new "superministry" headed by the minister for external trade, Edith Cresson, and Curien has been given Chevènement's original more modest responsibilities as minister for research and technology.

The 59-year-old Curien, a crystallographer by professional background, is not widely known in mainstream political circles but has had a long and distinguished career in research administration. He was promoted from scientific director to director of the CNRS in the mid-1970's and was subsequently appointed head of CNES by President Valéry Giscard d'Estaing in 1976. Mitterrand appointed him to a third term as CNES director.

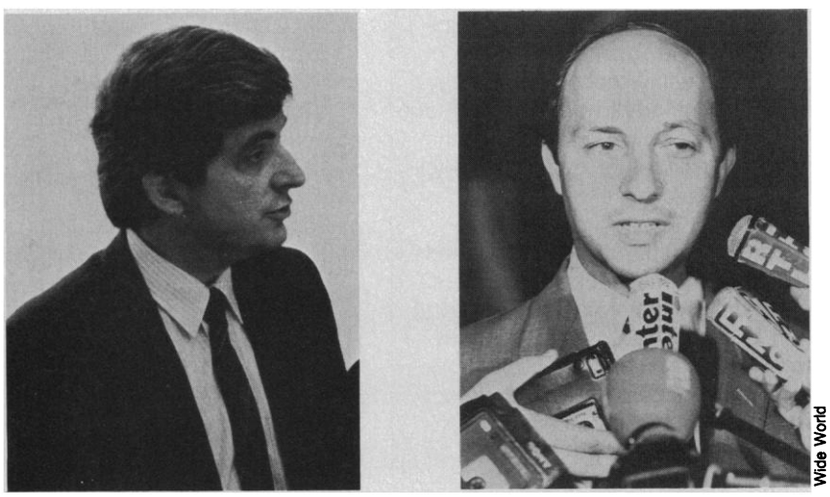
Like Fabius, Curien is strongly committed to greater European collaboration in research. He is currently president of the Strasbourg-based European Science Foundation and vice chairman of the main scientific advisory body to the commission of the European Economic Community in Brussels, and is also the former chairman of the council of the European Space Agency. Curien is said to have particularly impressed Fabius during the latter's visit to the ESA's launch site in Kourou in French Guiana to watch the key test launch last summer of the rocket Ariane.

In an interview last year, Curien made it clear that cooperation on technological ventures such as the development of a new generation of Ariane launchers had a firm commercial basis. "It is not just a question of economies of scale or of maintaining good relations, it is a question of business. If we do not have the ability in Europe to launch our own satellites, we will never get any business from outside our own countries; that is why we have always insisted that Europe should have its own launch facilities."

Curien, referred to by one observer as "a politician with a small 'p'," will inherit several pressing issues from his predecessor, ranging from negotiations with West Germany over the siting of the European synchrotron radiation facility (*Science*, 27 July, p. 391) to the drafting of a new research law to replace the current version, which runs out next year.

However, he is likely to feel less political pressure than Chevènement, who has been given the task of devising a strategy for implementing the government's controversial plan for the reform of private schools. Chevènement's predecessor, Alain Savary, resigned as minister of national education shortly after Mitterrand announced that the government was withdrawing a bill outlining such reforms, which had already been passed by the National Assembly. The bill stimulated nationwide protests by supporters of the private schools, culminating in a demonstration by 1.5 million people in Paris at the end of June.

Although Chevènement is firmly committed to the ideological principle on which the left's opposition to private schools is based, he has also made clear his strong belief in France's elite system of *grandes écoles*, a combination which could lead him to take a different approach to school reform from Savary.



France's new prime minister, Laurent Fabius (right), is a former research minister, as is the new education minister, Jean-Pierre Chevènement (left).

At the same time, judging from his previous action as minister of research, where he introduced a series of institutional changes designed to increase contacts between the research community and the industrial sector, Chevènement is likely to push for closer links between industry and all levels of French education.

In doing so, he will be building on foundations already laid down by Savary. Reforms of the university system, successfully passed into law at the beginning of this year, laid particular emphasis on the need to integrate professional concerns into the university curriculum.

Chevènement—once tipped as a possible prime minister himself before his fall from grace last year—is also expected to pick up on Fabius's eagerness to introduce computers into education. The government has recently committed itself to placing 100,000 microcomputers in French schools within the next 3 years.

—DAVID DICKSON