Is French Scientific Policy Chauvinist?

Paris. As France searches for a convincing modern form of national greatness, the government of Charles de Gaulle gives prominence to science and technology. Total French spending on research and development has at least quadrupled since 1958. Under the pressure of such rapid expansion, the government is moving to reorganize its scientific efforts. Meanwhile, science and technology have figured strongly in French diplomatic maneuvers.

But are these policies narrowly nationalist? Do they indicate some broad economic-political-technical plan for French hegemony over an independent Europe?

To answer "yes" to these questions would be to read too much into recent events. It is much more likely that the French are seeking to do their best in fields which are obviously essential to economic advancement and political strength. Far from disdaining international collaboration, the French realize that they must extend limited resources through participating in multinational projects. If French engineers and scientists lead in some fields, so much the better, in French eyes. But if their efforts should lead to technical dominance of Europe, it would mean that the rest of Europe had been asleep.

For the unwary, there have been many temptations to call French scientific and technical policies chauvinist. Questions about the real drift of these policies keep cropping up, as the pride and even essential interests of Britain, the United States, and other countries are touched, even bruised, by French assertiveness.

There have been minor incidents, such as the possibly exaggerated French response to American aerial photography of the Pierrelatte gaseous diffusion plant. There were difficulties about obtaining permission this year for scientists to study a solar eclipse whose path came within some degrees of latitude of the nuclear test site France is now building in the Pacific. The French Academy of Sciences passed a resolution urging French scientists to use their mother tongue at international conferences, and President de Gaulle made a point of endorsing the Academy's action in ringing tones.

There have been developments of more substance, as well. While France continues to stress her determination to reorganize the North Atlantic Treaty Organization, she also continues to build a nuclear striking force, even as Britain rejects the expense of a truly independent nuclear deterrent.

In the field of color television, the French signed an agreement with the Soviet Union which appeared to open up large future markets for a French modification of the basic American process, and incidentally spoil the chance of developing a unified European color television system. The government was so delighted with this diplomatic success that it held a special ceremony to confer the rank of Officer of the Legion of Honor on the inventor of the "Secam" modification, an engineer with the apposite name of Henri de France.

A number of events in the past 2 years have seemed to bear out the view of observers who feel that France is not comfortable with international collaboration. The French government removed a director of the European atomic energy community (Euratom) whose attitude was too "European" or "supranational." Toward the development programs of both Euratom and the European Launcher Development Organization (ELDO), France has taken a tough line. On the night of 30 June, the French government refused to continue bargaining on Common Market agricultural policy beyond a deadline and decided to "freeze" further planned steps toward integration of the six Common Market nations. It is not certain now that the executives of the economic, atomic, and coal and steel communities will "fuse" as scheduled at the end of the year.

So, to many, it appears that French intransigence has placed in jeopardy the whole structure of European economic and technical collaboration, on which an effective response to the American challenge depends.

Because of the nationalistic note in French technical policy, it is easy to overstate the element of nay-saying. Looked at closely, many French moves seem to rise naturally from domestic needs which are felt as strongly in Britain or West Germany, nations of comparable size. Indeed, the differences between French and German and British policies seem, in the main, rhetorical. Since Sputnik, all three countries have been expanding support of research and development almost as rapidly as the United States has, even though their gross national product per capita is half the American figure and thus leaves less room for research.

It is in this light that recent changes in the personnel and organization of French science programs should be viewed. One important move was the substitution of Yvon Bourges, 44, for Gaston Palewski, 64, as the chief political officer for science. Although Prime Minister Georges Pompidou is known not to have a lively interest in science, Bourges was placed right under Pompidou as a secretary of state, instead of being given Palewski's grander title of minister. Bourges, a lawyer, rose through the colonial administration. He is mayor of the town of Dinard in Brittany, near the world's most ambitious tidal power project—the Rance River scheme, now being built.

Another important transfer was that of Pierre Aigrain, professor of electrotechnology of the University of Paris, from the defense scientific directorate to the directorate of higher education in the ministry of education. Aigrain and his superior, Malavard, the head of the DRME military research and testing agency, left together. Since 1961 they had stressed the building of strong ties between the military services and the scientific community. Such an effort

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was an important part of de Gaulle's plan to convert the politically dangerous armed services, stung by 20 years of defeats, into technologically advanced forces. As Aigrain moved over to handle the tangle of problems rising from the enormous expansion of French university enrollments, a high official from the education ministry took over at DRME.

To manage a much-expanded program of biological and medical research, the French have formed a new National Institute of Health and Medical Research to replace the old National Institute of Hygiene. The new institute has advisory panels modeled on those of the U.S. National Institutes of Health, and will be setting up many new units.

Changes in the top administration of the National Center for Scientific Research (CNRS) are being considered. The CNRS administers laboratories (scattered in many parts of France) in all fields of science and in the humanities, and its staff has expanded from under 7000 in 1959 to over 11,000 in 1965.

For some time there has been worry about an overconcentration of researchers in Paris. The research plans of many agencies include efforts to disperse "centers of excellence" (to use the American term) to other regions. This theory has underlain the growth of the atomic energy research center in Grenoble, headed by Louis Néel. Because of the Grenoble center's strong emphasis on solid-state physics, Grenoble was a logical choice for the site of a French-German high-flux reactor scheduled to begin research in 1969.

French policy-makers are giving much attention to the problem of aiding industries to make use of new technology. A program of such aid, formerly run by the ministry of industry, has been transferred to the scientific secretariat known as the Délégation Générale. The new program will focus on a few industries at a time, starting with machine tools and heavy electric equipment. The Délégation Générale has $2 million to start with, $200,000 of it for developing an automobile motor. It is likely that the program will get $10 million in 1966.

It is true that such programs are aided by cries that two of every three patents registered in France cover the inventions of foreigners. But such cries hardly differ from those heard in Germany or Britain, where there is equal concern about American technological leads and American commercial control of West European business. There was nothing typically French about the alarm in 1964 when Machines Bull, the largest surviving French computer firm, found that it did not have the new technology to compete, and so had to sell out to General Electric, which was chiefly interested in Bull's sales force.

> "To safeguard our independence—economic, scientific, technical—we must ensure that our activities remain under French direction and administration, even though we confront the enormous wealth of certain countries and although we will not refuse to carry out all kinds of exchanges with them. Likewise, we must support, no matter what the cost, those activities which assure the value, the autonomy, the very life of all our industry, those sectors which require the most research, experiment and sophisticated tools or which need the largest team of scientists, technicians and workers of the highest quality. Finally, when it is opportune in a selected branch to join our inventions and money and skills with those of another country, we must choose the country nearest to us and whose weight could not crush us."
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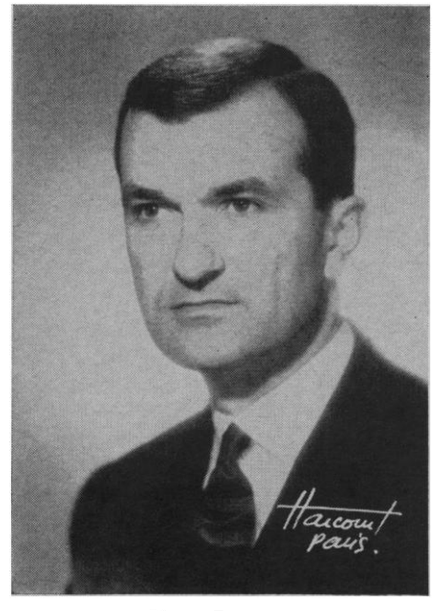
> —CHARLES DE GAULLE, 27 April 1965

It is clear that France recognizes that in many fields she must collaborate with other nations, or groups of nations, even if this means taking care not to be swallowed up. This is why she entered the joint project with Britain to develop a supersonic airliner, and why she held on like death in the fall of 1964 to prevent the British from withdrawing.

In the field of nuclear energy France has followed a moderately aggressive course. In negotiating with Canada for a long-term supply of uranium she has sought to supplement the supplies she gets from her own territory and from her former African colonies. During the bargaining with Ottawa, France was willing to agree not to use Canadian uranium for military purposes if Canada would agree not to sell uranium to the United States, Britain, or any other country for military use. Canada agreed.

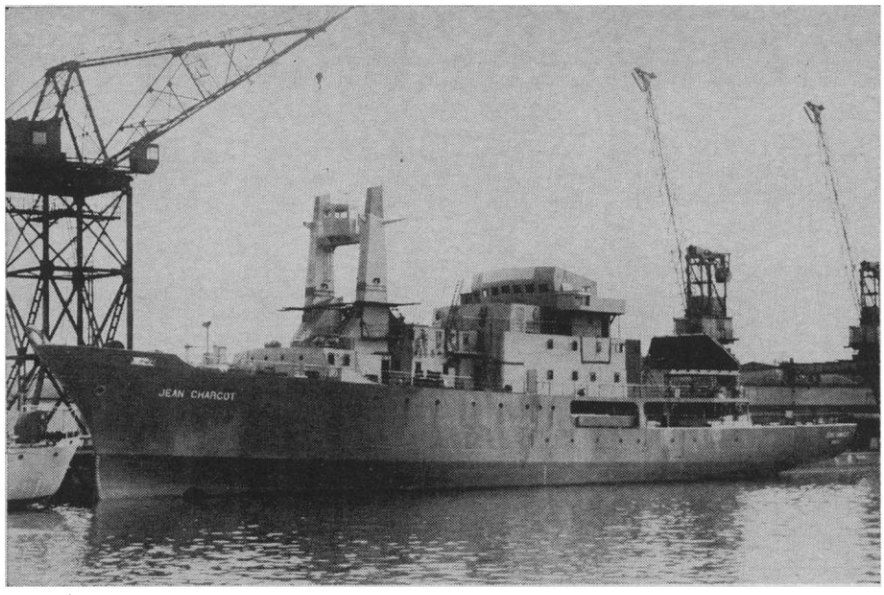


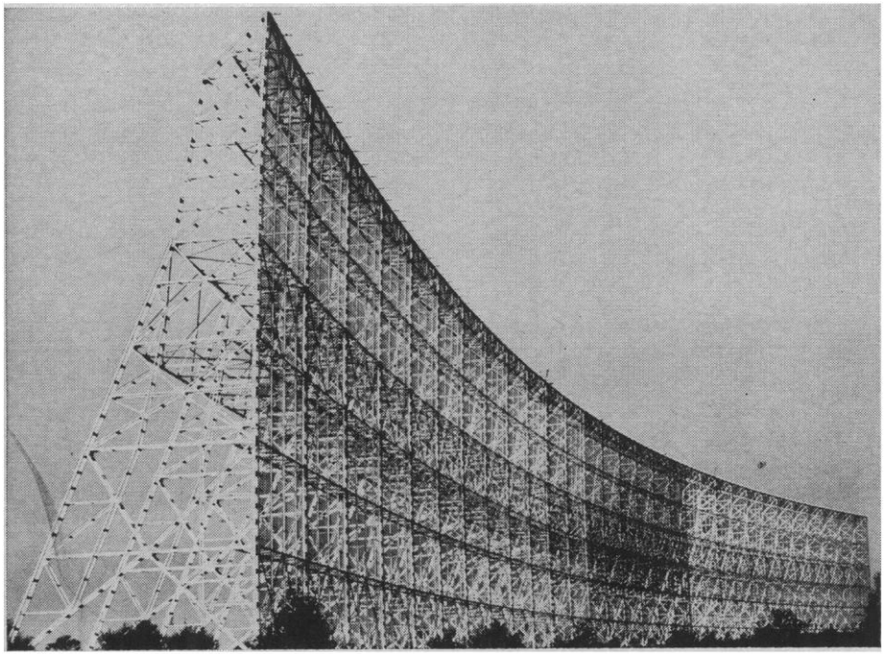
Yvon Bourges

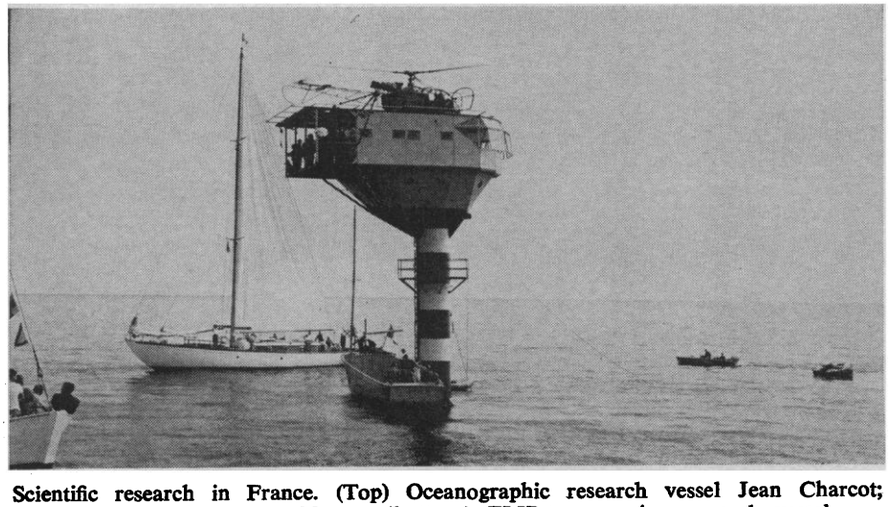
Presumably without safeguards, France has supplied natural uranium to Israel for the 20-megawatt reactor at Dimona near the Dead Sea. However, American engineers were allowed early this year to inspect the reactor to see that its fuel cycle was not that of a plutonium-production reactor. Early in July there was a flurry of talk in New Delhi to the effect that France might assist India in building a pair of 200-megawatt reactors at Kalpakkam in Madras state (not one reactor, as reported incorrectly in *Science*, 16 July) in order to help India acquire militarily significant quantities of plutonium.

In September 1964, France sold her first reactor abroad, but not by methods notably more forceful than those used by Britain or the United States. Spain and France agreed to build a French natural uranium reactor in Catalonia. Part of the cost would be met from loans made already to Spain. Another part would be met by the French power authority, Electricité de France, which would also buy part of the station's output during its early years.

France's tough stance in Euratom does not support an extreme view of her technical policy. In the 1964–65 quarrel about Euratom's research pro-







Scientific research in France. (Top) Oceanographic research vessel Jean Charcot; (center) radio telescope at Nançy; (bottom) FLIP-type marine research vessel.

gram, France was basically insisting that the program's scatteration be reduced, and that emphasis be shifted decisively toward the future. Of course, if that shift of emphasis reduced Euratom's support for bringing American reactors into Europe, France would not be displeased.

Space programs illustrate most decisively France's need for international collaboration in science and technology. It is true that France, unlike Britain or Germany, is developing its own satellite launcher. But French observers acknowledge that this launcher stretches certain technologies to the limit and that great improvements are more than the French budget can stand, for the present. This is the meaning of France's attempt, poorly coordinated and inadequately prepared, to convince her fellow members of the European Launcher Development Organization that present upper stages should be scrapped in favor of an immediate start on liquid-hydrogen rockets. It is true that French engineers were interested in such rockets for all-French rockets and satellites. This can hardly override the fact that the French were proposing a positive idea for ELDO's future when the mission of the ELDO rocket now being developed was evaporating.

Recognizing the benefits of collaborating with the United States, French space scientists have provided experiments to be launched on American geophysical satellites. NASA is to launch a satellite for France in late 1965 (long after having done so for Britain, Canada, and Italy). For years, Jean Blamont has collaborated with Americans and others on sodium-cloud experiments in many parts of the world. France is providing India with a rocket launcher and several two-stage Centaure missiles, as well as a license to manufacture Centaures in India (experience in making Centaures is an essential step in India's plans to develop her own scientific rocket). And France's satellite-tracking network across Africa will be at the disposal of the European Space Research Organization.

The main fact about French scientific and technical policy is that it must be conducted within limits of size and geography. France is closely linked, both politically and economically, with the United States and Western Europe. Rhetoric aside, French scientific initiatives cannot be a bid for dominance, but only a challenge to others.

—VICTOR K. MCELHENY