

give impetus to concerns at home and vice versa. With a rising squeal from such positive feedback, a few state and local moratorium movements may just succeed.

The industry is not, of course, taking all this lying down. Companies such as Westinghouse have started to establish a new public relations presence with the press in Washington and the Atomic Industrial Forum recently has been treated to the disclosure of its war plans.

In an internal memorandum written last December and obtained and widely circulated by environmental groups, the AIF's public relations committee talked about shedding its characteristically defensive posture and mounting

an aggressive "public acceptance" campaign that would include a national speaking program, ghost-written articles for famous scientists, the staging of "special events," and press junkets.

The AIF, though not, in the eyes of the Internal Revenue Service, a lobbying organization, also discussed making an end run around the major news media by direct mailing of information to government decision-makers and community leaders.

"Because of the unwillingness of the major media to present the positive side of the nuclear power story, we must begin reaching such decision-makers directly," the memo said, but added later that "There is an urgent need to initiate frequent and substan-

tive news events, to counter the pseudo-press conferences held regularly by the national critics. . . ."

With both critics and proponents taking increasingly strident positions, the outlook is for an increasingly shrill and bitter collision of moral outrage with moral righteousness, of punchy pamphlets in the mail, zingy ads on television, and staged news events on both sides. There is, in the coming congressional debates, an opportunity for a fresh start in the long and tangled national argument over nuclear power. But it may be too much to expect that members of Congress, any more than ordinary citizens, will succeed in drawing sensible conclusions from the din.

—ROBERT GILLETTE

Pasteur Institute: Public Funds for a Private Institution

Relief for the financially beleaguered Institut Pasteur in Paris is expected soon in the form of increased funding by the French government. This would mean that a plan proposed by the institute's director, Nobel laureate Jacques Monod, to move the institute out of central Paris will not be carried through.

No official word that the government will provide crucial funding was forthcoming when this was written but reliable sources in Paris and in the United States indicate that such a decision has been made. General prospects for science brightened recently when French President Valéry Giscard d'Estaing made an unexpected pronouncement on research funding, giving high priority to major increases in support of R & D including basic research. Besides, the institute is figuratively and literally a national monument—Pasteur is entombed in a chapel on the grounds—and it would be difficult for any French government to allow the institute to be broken up or moved from its historic site.

Monod put forward his plan last October at the same time he announced that the institute's financial condition was so grave that it would no longer be able to pay salaries and bills after May. Opposition to the move was strong

among staff scientists and technicians, whose main argument was that the institute's traditional links with hospitals and universities in Paris were essential to its research and teaching functions.

Monod said at the time that his proposal was a "hypothesis" and apparently did not press the institute's governing board for a decision. A high-level official of the Ministry of Health was invited by the Pasteur board to study the institute, and his report is expected to influence strongly the decision on the matter. The "rapport Morin" had not been released at the time this was written, but informed sources expect the government and the institute to agree on a formula under which the institute will remain in Paris and the government will increase its support.

The institute's financial malaise has become acute in the past few years, but the condition has been present at least since World War II. In fact, it is possible to argue that, from the beginning, the Pasteur has suffered from chronic institutional altruism.

The institute was established in 1886 as a private research organization through international subscription in the blaze of gratitude ignited by Pasteur's development of the rabies vaccine. In France, Pasteur was the great non-imperial hero of the 19th century, and

he still occupies a special place in the French pantheon. Pasteur, his colleagues, and their successors through the years signed over the rights to their discoveries to the institute. But, while the institute, from the beginning, sold vaccines, serums, and biological products, it did so primarily as a public service and did no licensing or collecting of royalties. So it is possible to see the institute's financial problem as the result of its humanitarian policies.

Scientifically, the institute continued to advance in the direction pointed by Pasteur, concentrating with good effect on research on infectious diseases. The contributions of the "pastorians" are too many to enumerate, but they include the development of diphtheria, tetanus, and typhoid vaccines and of BCG, and antituberculosis vaccine. A hospital for infectious diseases has operated on the Paris campus since early in the century, and "peripheral" institutes were established in a number of French colonies. The Paris campus became a reference center for pathogens, an important public health function which continues.

Monod and his colleagues François Jacob and André Lwoff shared the Nobel Prize for Physiology or Medicine in 1965, thus joining five other Pasteur researchers who had earlier won the award. (Jacob, Lwoff, and Monod are counted among the founding fathers of molecular biology. They received the Nobel award for their work in advancing the understanding of the regulation of gene activity and of the manner in which cells synthesize protein.) But despite scientific laurels and public esteem, the institute had for decades

been considerably less than affluent.

Until the end of World War II the Pasteur managed to scrape along. But then pressures mounted because of the rising costs of research and competition from the increasingly efficient French pharmaceutical industry, which, incidentally, cast covetous eyes on the institute's production activities. By the end of the 1950's, it was clear that inefficient facilities and marketing practices were hobbling the production operations and that outmoded administrative machinery was breeding conflict in the research branch.

Internationally, the scientific reputation of the Pasteur was decidedly mixed at the time, but the work of Jacob, Lwoff, Monod, and others, particularly in the department of cellular biology, retained the old luster. Within the institute, the prestige of the Nobel enabled the three laureates and like-minded colleagues to tip the balance toward the major changes they argued were necessary. In addition to new leadership and organization, physical renovation was badly needed, as well as redirection of the scientific program, which sagged badly in some departments. To outsiders it was Monod who led the revolution at the Pasteur and it was Monod, in 1971 after the reformers had won the day, who was named scientific director.

Monod's stated aim was to expand the production facilities and to put them on a more profitable footing. By capitalizing on the scientific work of the institute to develop new products, he hoped to assure the long-term equilibrium of the whole enterprise. He also gave high priority to maintaining the traditional independence of the institute, which meant avoiding heavy reliance on government support and the influence that would entail.

Monod plunged into a strenuous effort at fund-raising in Europe and the United States and made some progress. In 1972, for example, there was a gift of \$1.7 million from Sir Max Raynes, a British financier, for building a new immunology lab. In the spring of 1973, the institute tapped the reservoir of goodwill toward it with *L'appel Pasteur* on French television and radio. A handsome \$5 million was raised, but the tradition of private philanthropy benefiting medical research is less developed in France than in Britain and the United States, and the financial tide was not turned.

In July of 1972, with the Pasteur's financial position still deteriorating, Monod announced a plan to set up the

production arm of the institute as a separate, private company, Institut Pasteur Production (IPP), with 100 percent of its stock owned by the Pasteur foundation. Monod became president of IPP, which meant that he took responsibility for the operation of modernized production facilities in Normandy and overhauling commercial policies.

In September of 1973, Monod went public with a gloomy analysis of the institute's financial prospects and a plan to "safeguard" the institute. Monod noted that production and sales were up but that so, disappointingly, were production costs. With inflation heating up in France, the institute's financial health was still declining.

Monod proposed a package of measures aimed at budget reductions, most notably a cut of 130 to 140 people from the staff of 750 at the "campus pastorien" and similar reductions in personnel elsewhere. He also hoped to increase income from services for which the institute was undercharging.

At this point Monod began to en-

counter serious opposition from unions which represent scientists, technicians, and workers at the institute. The rank and file tended to be resentful because he had blocked what they felt was a reasonable pay raise, and the threat of layoffs triggered trade union reflexes. Among the scientists, Monod's efforts to retire some older, less productive researchers had earned him hostility from old-timers.

During the next year—the year of the energy crisis and of accelerating inflation—difficulties multiplied. Problems with the new manufacturing facility in Normandy continued. A new and much heralded flu vaccine proved so unexpectedly costly to produce that it was wryly observed that another success like that would ruin the institute.

Last October Monod concluded that the institute would no longer be able to meet its financial obligations after May, and as a drastic recourse he recommended that the institute sell the property in central Paris and rebuild a new institute on property at Garches, some 10 kilometers southwest of Paris. Part

Briefing

Worldwatch in Orbit

Lester Brown, who has made a name for himself analyzing and publicizing the world's food, population, and economic problems, has set up a little think tank to institutionalize his approach to resolving global dilemmas. It is called Worldwatch Institute, and it is situated in Washington, D.C., across the street from the Overseas Development Council (ODC), where Brown worked until he left last fall to start the new venture.

Brown prides himself in being a "synthesizer," and he hopes Worldwatch will prove itself uniquely capable of applying interdisciplinary and anticipatory thinking to the complexities it has chosen to grapple with. His staff of eight so far includes Eric Eckholm, his coauthor and alter ego whom he brought with him from ODC, Jim Fal-lows, a former Rhodes Scholar who was with the *Washington Monthly*, and Denis Hayes, environment and energy specialist remembered by some as the coordinator of Earth Day. Worldwatch is starting out with a project on "redefining national security," which

involves emphasizing the nonmilitary aspects of security. "OPEC [the Organization of Petroleum Exporting Countries] has a much greater stranglehold on us than the Russians ever had," observes Brown. Another project will examine the ecological undermining of food systems—by deforestation, overgrazing, climatic changes, and so forth. Various energy studies are under consideration, as is an examination of the changing roles of women around the world.

Brown, who has Ralph Nader-like work habits, wants to keep his institute small and fat-free, with an ultimate staff of no more than 20. Worldwatch's four-man board of directors, which includes Orville Freeman, Brown's old boss at the Department of Agriculture, will be expanded to perhaps 20 with representation from around the world.

So far, money doesn't seem to be a problem. The institute is being launched with a half-million dollar grant from the Rockefeller Brothers Fund, and there is money from other sources including the United Nations Environmental Program. Worldwatch expects to operate with an annual budget of about \$500,000.—C.H.

of his reasoning was that the money realized on the sale would make it possible to pay off the institute's debts and enable it to build expanded facilities. The move would also enable the Pasteur to avoid the expense and difficulty of reconstruction of several decrepit buildings on the cramped Paris

campus. After all debts were settled and new construction paid for, Monod expected that a substantial sum would remain to help with operating costs in the future.

The backlash from the unions sharpened. In December, the unions announced that a referendum answered

by 79 percent of their members had shown 95 percent favored permanent funding by the government and 92 percent opposed the move to Garches. Equally adamant were some of Monod's close colleagues and old friends. Jacob is reported to have been saying, "I will not go to Garches. I will not go any-

Senate Study Predicts U.S. Oil "Exhaustion"

The United States could become more, rather than less, dependent on imported oil by the end of the century if the government continues its policy of maximum offshore oil development, according to a report of the National Ocean Policy Study (NOPS), a special staff group of the Senate Committee on Commerce. Accelerated offshore oil development, it concludes, could mean accelerated oil exhaustion.

The recently released draft report, prepared by staff at the Office of Technology Assessment for the NOPS, reaches these conclusions through a survey of the technical literature on U.S. energy resources, including the most recent report of the National Academy of Sciences (NAS) on the subject (*Science*, 28 February).

Stepping into the current controversy over how much oil and natural gas the country actually has left, the NOPS report argues that if the more pessimistic estimates of the total U.S. resources are correct, the country could "exhaust" these resources as early as 1998. Furthermore, since alternative energy sources are not likely to be ready to meet national needs before sometime in the next century, this exhaustion "may lead to a greater dependency on imports in the long run." The NOPS is a high-level study group established last year to give coherence to congressional actions regarding the many aspects of federal oceans policy (*Science*, 21 June 1974).

Most experts agree that much of the remaining undiscovered U.S. oil, perhaps two-thirds of it, lies offshore beneath the outer continental shelf (OCS) and in Alaska.

The federal government has leased 5000-acre offshore tracts for oil drilling since 1953, but in the midst of the Arab oil embargo, former President Nixon announced a plan to lease 10 million acres in 1975 alone, an acreage equal to that leased in the entire history of the program.

The 10-million acre accelerated leasing program has been criticized on environmental grounds and by governors of the coastal states whose economies will be affected (*Science*, 15 November 1974). But the NOPS report objects to it as bad energy policy.

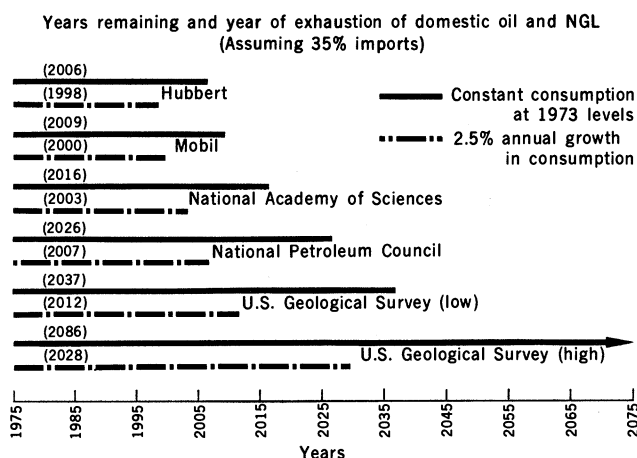
"The purpose of the accelerated OCS leasing program is to provide the new production that is needed to replace declines from old wells and to reduce or eliminate the need for imports. However, the complete replacement of imports by new domestic production could create a need for greater imports by the end of the century," if the low estimates of OCS resources are true.

The NOPS report bases its statements about "exhaustion" on a series of calculations of U.S. oil consumption over time (see chart). The calculations give new relevance to the various low estimates of U.S. oil resources made most recently in the NAS report, and previously by M. King Hubbert of the U.S. Geological Survey (USGS) and by Mobil Oil Corporation. These estimates are dramatically lower than those that the USGS has used for many years.

What does all this have to do with OCS policy? "The fact which has not been clearly recognized in discussions of an accelerated OCS leasing program is that the appropriate rate for the development of domestic resources is dependent upon which estimates [of total U.S. oil] are correct," says the report. If the optimistic, or high estimates are valid, then "we have plenty of time to develop alternatives" and can proceed with OCS development, it says. But if the pessimistic, low estimates are right, the government needs to place curbs on energy demand, to speed development of alternative energy sources, and to limit domestic oil production, including OCS oil "below the maximum efficient rate."

The report calls for more exploration prior to a stepped-up program of production—a conclusion that is at the crux of some NOPS-drafted legislation now before the Senate. Under the bill principally sponsored by Senator Ernest F. Hollings (D-S.C.), the federal government would declare a moratorium on all OCS leasing until after it had conducted its own exploratory drilling program and had arrived at a more definitive estimate of the true extent of the nation's treasury of offshore oils.

—DEBORAH SHAPLEY



According to the chart adapted from one in the draft report, U.S. oil resources could run out in 1998 or last through 2075, depending on whose estimates of the total resource prove right.

where." He is also said to have formulated an alternative plan, the essentials of which were a call for a rebuilding of the institute on the present site on the assumption that the government would decisively increase its funding.

Monod was up against the notorious Pariscentric preferences of the French (the Pasteur metro stop is on a correspondence for two lines and is one stop from the Bienvenue-Montparnasse station on the line which goes through the fashionable 16th arrondissement to the Étoile.) Monod apparently did get a favorable reaction on the Garches proposal from some of the younger scientists, who responded to the prospect that they would be more likely to get additional lab space and money for their own research at Garches than they could look forward to in Paris. Monod, however, apparently did not push the exodus and debate has essentially been suspended with everyone awaiting the word from the Health Ministry. Monod did take one major action in December, however, in stepping down as president of IPP while remaining head of the Pasteur foundation and scientific director of the institute.

At this point, no details of the prospective settlement are available, but the unofficial comments of French officials indicate that the following decisions can be expected. The institute will continue in Paris with some reconstruction probable. Many, perhaps most, of the staff will become government employees and government funding of other Pasteur services will be increased. The future of the production facilities is uncertain, but some observers predict a takeover by Rhone-Poulenc, France's largest pharmaceutical and chemical firm, which already has extensive contacts with IPP.

This is the merest sketch of events and does not suggest the strains that developed during the crisis both within the Pasteur and between the institute and the government. Inside the institute, for example, molecular biology research, which is carried on in the newest and most imposing building on the campus, is envied for the prestige and the resources it commands. The argument has been made that the basic research carried on by the molecular biologists, for the most part, cannot be capitalized on in the form of new products to be manufactured and sold.

It is true that work at the Pasteur falls into two rather distinct categories: basic research and more applied research with a public health orientation.

Most American researchers view the work at the Pasteur in virology, immunology, and molecular biology generally as of much higher quality than the work in most other sections of the lab. Not surprisingly, it was the cohorts of Monod, Jacob, and Lwoff who were most insulated from the crisis at the Pasteur.

In a report to *Science* on the Pasteur situation in November, Lynn Payer, a free-lance science writer working in Paris, described the situation.

Most of the scientific personnel in Molecular Biology receive all or part of their income from sources other than the Pasteur Institute itself, mostly from the Centre Nationale de la Recherche Scientifique (CNRS) and from the Collège de France. Because of this, they cannot share Monod's often-stated fear of the effect of nationalization on the Institute, since both CNRS and the Collège de France are government bodies anyway. "If I had to choose between transfer and nationalization, I would choose nationalization," said Changeux (Jean-Pierre Changeux, a former pupil of Monod and chairman of the department of molecular biology, a rotating post). . . .

Elsewhere in the institute, where scientists are still in relatively shabby quarters, there is more to gain but also almost complete funding by the Pasteur Institute and thus perhaps a greater interest in its ultimate fate. They share the misgivings that the [Monod] plan won't work, as well as, for the most part, a reluctance to commute to the suburbs. In addition, departments such as Bacteriology, where scientists believe that their work is more in the tradition of the original Pasteur Institute than the more fundamental work in molecular biology, feel that access to the Parisian hospitals is very important to their public health role. While their contact with the department of molecular biology is negligible, they have built up a relationship with hospital doctors who are their students and spend part time working with them; and they consider this relationship precious.

"I'm doing work on five different bacterial strains, all of which were brought in by the physician-students," said one bacteriologist. "Most of the time the strains they bring in are not interesting but two or three times a year it's a good strain. They just drop in with a petri dish, and they will not go to Garches with just one petri dish."

Assuming that the reports of an accommodation are borne out, what does this imply for the "independence" of the Pasteur and for Monod? His reaction may well depend on the degree to which the government's offer means "nationalization."

When he announced his *plan de sauvegarde* in 1973, with its call for layoffs, he said, "I accepted direction of the Institut Pasteur to preserve its in-

dependence and avoid nationalization. If this becomes inevitable, I will lay myself off."

Those who know Monod say he took the directorship out of loyalty to the institution in which he has spent most of his professional life. They also say he felt a responsibility to work for the Pasteur's independence as defined by his own strong and highly personal social and political views.

Monod was active during World War II in the military section of the Resistance, which, in France, was dominated by the political Left, notably by the Communist party. Along with others of his generation, like Jean-Paul Sartre and Albert Camus (who was a personal friend of Monod), the wartime experience seems to have given Monod a heightened interest in moral and philosophical questions.

And while Monod, with his good looks, energy, and brilliance seemed the *beau idéal* of French intellectuals, he rejected the orthodoxies of both the Right and Left and has been viewed as a maverick. He advocates a non-Marxist, antistate, decentralized socialism, which his critics on the Left say smacks of elitism and individualism.

At Pasteur he has hardly been an orthodox administrator. As Payer writes, "Monod, in an administrative style reminiscent of his scientific style, has put forth a series of bold propositions: first the creation of a factory to market the patented fruits of the institute's scientific labors, then a large-scale fund drive, then large-scale firings, and so forth."

But whatever Monod's political views or his administrative or personal style—he is sometimes autocratic in his actions, which has earned him the nickname "Louis quatorze" among some at the institute—the Pasteur's predicament appears to be rooted in the formidable problems afflicting the institute. Even when Monod first took over, some close observers felt that preserving the traditional independence of the Pasteur was an impossible task, whatever the scientific and entrepreneurial talents of the director.

A few years ago Monod published a successful book, a quintessentially French work, in which he combined lucid scientific exposition with highly personal ethical and philosophical conclusions. The book was titled *Chance and Necessity*, and it would seem that in recent years the Pasteur and Monod have been subjected to the unkind workings of both.—JOHN WALSH