Newport News officials, as well as most close students of Naval shipbuilding, say that Rickover is part of the program's problem but not all of it. The charge against Rickover is that in the three yards qualified to work on nuclear powered ships, Rickover constantly interferes with the work, requiring work to be redone or changed, regardless of the impact on schedules or costs. His most severe critic has been former Navy procurement chief Gordon Rule, who has said that there are really two navies—one made up of people accountable to Congress and the public and the Secretary, and the other accountable only to Rickover. Rule has gone so far as to name various admirals on the procurement side, whose titular responsibilities have little to do with nuclear power, but who nonetheless conduct the Navy's business the way Rickover wants. He says, "Rickover is constantly injecting himself into the contractural or business side of the Navy, an area in which he has no assigned duties. . . ." As a specific example, Rule has charged that one of Rickover's deputies succeeded in overturning a settlement Rule negotiated with Newport News on behalf of the Navy over the contract options to build the nuclear cruiser *Arkansas*. A second court test of the question is scheduled for next February.

Rule's charges were echoed in a recent article called "The breakdown in naval shipbuilding"* by John Newell, a former executive of Bath Iron Works in Maine. Newell wrote that Rickover "continually redefined the scope of the work and interfered on a grand scale with normal shipbuilding procedures. . . . There will be no improvement until Congress . . . retires every officer in accordance with the statutes."

On the other hand, even his critics say that Rickover's retirement would not change the Navy's method of procuring ships. The habits that have developed in the procurement bureaucracy, they say, will not be eradicated so easily.

The Navy's response to all this has not been limited to trying to settle the claims. "We recognize that we have management problems too," says Rear Admiral Cooney. These, he says, are being studied jointly with the companies' participation by the Assistant Secretary for Manpower, Reserve Affairs, and Logistics Edward Hidalgo. The Hildalgo interim report, issued in 1977, is a listing of charges and countercharges between the Navy and the companies, listing the problems of late government furnished equipment, change orders, and the like.

**United States Naval Institute Proceedings*, January 1978, "The breakdown in naval shipbuilding," p. 25 ff.

It also seems typical of the rest of the Navy's delicate approach to the Rickover issue; the interim document which is 294 pages long, nowhere mentions Rickover by name or singles out the nuclear ship program for separate treatment.

The Navy is also using a new kind of contract that will allow lead ships of a class to be bought on a cost, instead of a fixed price, basis. The new escalation clauses that allow more realistically for double digit inflation, according to Navy officials, are also less likely to get the yards into the sort of economic aggravation that can lead to claims. Finally, Navy leaders boast that at least one new ship, the FFG 7 nonnuclear frigate, recently built at Bath, Maine, is following the lead-ship, follow-ship philosophy and the first ship, the *Oliver Hazard Perry*, was recently delivered on schedule and on cost.

But one ship built on time and below cost does not an entire fleet make; it does not assure that the more complex nuclear powered ships that the Navy is building can also be built on time and below cost. In short, it is not yet clear to the Navy's critics that the service has realized that to go on building state of the art ships means, in the long run, a constantly dwindling fleet.

—DEBORAH SHAPLEY

Science in Europe/Professors' Pay Strike May Lead to Free Degrees

London. Five years of tight budgets and declining real income have left British universities in a delicate financial situation. Academic salaries lag behind inflation and university teachers are threatening, for the first time, to refuse to mark final examination papers if the government does not meet their demands for more pay. In addition, support for research has fallen so far as to threaten an "irreversible decline" in academic standards, according to the University Grants Committee, the body responsible for channeling government funds to the universities.

How serious the situation appears depends on who you talk to. Lord Vaizey, professor of economics at Brunel University in Surrey and an observer of the British educational scene over many years, talks of a "growing demoralisation" in the universities caused by disappointed expectations and the fact that education is no longer held in high esteem. " 'Hold on to your jobs' was once a principle that applied only to politicians," he told a meeting of the NATO Science Committee in Brussels in April. "Today it applies to professors as well. There are so few jobs going that everybody stays where they are."

Laurie Sapper, general secretary of the Association of University Teachers (AUT), also believes the situation is serious. He is leading the AUT into its first experience of industrial action, a baptism not wholly to the taste of some of his more conservative members. But he says that the patience of university teachers has snapped: "even the most conservative of institutions is showing anger that would not have seemed possible 5 or 6 months ago."

Others are more phlegmatic. Sir Sam Edwards, a professor of physics at Cambridge and until recently chairman of the Science Research Council, believes that the situation is difficult but not desperate. Universities could do more to help themselves, he says, if they managed their affairs more efficiently. "The real trouble is that universities are well-adapted to an expanding budget, but don't have a mechanism for managing contraction," he says. "When difficulties do come they respond by spreading the suffering around equally to all the departments, instead of being more decisive and using the money to best advantage."

There are two problems, distinct but interrelated, which have brought about the present malaise in the universities. The first is a dispute over academic salaries which has been festering quietly since 1975 when the introduction of the government's pay policy prevented aca-

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demics from getting the increase in salary that was awarded by an independent arbitration panel. Britain in 1975 was a jittery country apparently on the edge of economic collapse: inflation was running near 30 percent, the currency was collapsing, and the smell of Weimar was in the air. The university teachers prudently decided not to challenge the government at that stage—they would have lost anyway—and settled for the official pay policy settlement of £6 a week, considerably less than the arbitration panel had awarded. Teachers in polytechnics, who had already settled before the pay policy was introduced, were thus able to leapfrog above their better qualified colleagues in the universities.

The pay policy, by catching some and letting others through, had thus created an anomaly which has rankled in the universities ever since. Wander into any senior common room and mention "the anomaly" and nobody will be in any doubt what you mean. Earlier this year, in a mass lobby of Parliament, 7000 university teachers turned up in academic gowns carrying banners urging the government to "rectify the anomaly." Since all universities in Britain (with the exception of one small college in Buckingham) are financed by the state, it is to the government rather than the university

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Antinuclear Protests Are Busting Out All Over

A season of antinuclear protest began on the May Day weekend with demonstrations directed at the nuclear weapons plant at Rocky Flats, Colo., and the nuclear fuel reprocessing plant near Barnwell, S.C. A series of rallies, organized by local antinuclear groups, but coordinated by the national Mobilization for Survival organization, have been planned in part to call attention to the U.N. General Assembly special session on disarmament from 23 May to 28 June.

The national agenda includes plans for a mass, nonviolent, direct action protest at the Trident submarine base near Bremerton, Wash., a 2-day event which will include an attempt by protesters to enter the base on 22 May. The Live Without Trident group is the organizer.

This and other events will lead up to major activities on the Memorial Day weekend in both New York and San Francisco. The New York program will start on 25 and 26 May with interreligious meetings. On Saturday, 27 May, a mass march to the U.N. and a rally there are scheduled; the next day a women's gathering is planned. The New York events, organized by the New York Mobilization for Survival group, is expected to draw a large number of participants from abroad including a group of 450 from Japan. At the rally on 27 May, a petition is to be presented to the U.S. mission to the U.N. asking that the United States take a number of specific steps toward outlawing nuclear weapons and controlling nuclear technology. In the expectation that these requests will not be met the New York group is planning a "sit-in for survival" at the U.S. mission on 12 June.

A rally, parade, and fair in San Francisco are now planned for 27 May to coincide with the activities in New York. The coalition of California groups organizing the program say they expect numbers of people from other Western states.

Other preliminaries to the Memorial Day weekend events include an antinuclear meeting in the Hollywood Bowl in Los Angeles on 21 May and a rally on the Berkeley campus on 24 May protesting University of California ties with the Los Alamos and Livermore weapons labs.

Later scheduled events include an effort on 24 June at reoccupation of the Seabrook nuclear power plant site at Portsmouth, N.H. The Barnwell and Rocky Flats protests—the latter was held in Denver—were timed to commemorate the Seabrook protest in May 1977 which is regarded as having given momentum to an organized antinuclear movement. The national Mobilization for Survival was created subsequently in an attempt to unite nuclear arms control groups with those opposed to nuclear power (*Science*, 28 October 1977). Mobilization now says that 200 to 300 groups are affiliated in a loose "network."

The Seabrook protest was sponsored by the Clamshell Alliance in Portsmouth. The alliance seems to have inspired other groups to use regional natural symbols in their names. Witness, for example, the Catfish Alliance in Alabama, the Oystershell Alliance in New Orleans, the Cactus Alliance in Utah and Arizona, the Red Clover Alliance in Vermont, and the Crabshell Alliance in Seattle. The Palmetto Alliance in South Carolina organized the Barnwell protest, and the Abalone Alliance in California plans a protest at the Diabolo Canyon nuclear power plant on 6 August—Hiroshima Day.

Science at State—Back to Square One

For the second time in less than 3 years a woman appointed from outside the State Department to State's top science post has resigned after a relatively short period in office, complaining that she had not been adequately involved in policy decisions. Patsy T. Mink, assistant secretary of state for oceans and international environmental and scientific affairs (OES), resigned effective 1 May after slightly more than a year in office. A predecessor in the job, Dixy Lee Ray, resigned in July 1975 after only 6 months on the job.

Mink went considerably more quietly than the feisty Ray, who rebounded vigorously into the governorship of the state of Washington. On her departure, Ray minced no words in expressing her disappointment that she and her staff were not consulted on relevant decisions and in laying the blame squarely at Secretary of State Henry Kissinger's office door.

Mink, a former six-term member of Congress from Hawaii, who has not indicated her future plans, told the Associated Press that her "opportunities to participate in policy decisions were far more limited than I had expected," and then made herself tactfully unavailable to reporters.

There had been some criticism that Mink seemed mainly interested in fisheries problems and had spent a lot of time at international meetings rather than in mastering the science issues facing OES, but there also seems to be general agreement that the real problem was not the occupant but the position, which currently seems to be one of the most thankless subcabinet jobs in government.

The OES office used to be mainly occupied with running State's science attaché program and administering scientific cooperation agreements, but a major reorganization a few years ago made OES responsible for a much wider range of issues including oceans, fisheries, wildlife, conservation, population, nuclear, and environmental matters. OES resources, however, were not notably increased and the office has not been able to overcome a chronic lack of bureaucratic clout.

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authorities that appeals must be directed.

The Secretary of State for Education and Science, Shirley Williams, has acknowledged that the anomaly exists and has offered to put it right gradually, over the next 3 years. But this is too slow for the university teachers, who decided at a special conference in March to refuse to mark final exams. Finals are still a vital part of the British university system, and unless the government agrees to implement the "frozen" pay award (which amounts to between 12 and 14 percent) by October of this year, the 75,000 students graduating from British universities this year will do so without degrees. The AUT admits that this will cause hardship to the students affected, but as Andrew Taylor, a member of the AUT executive, put it to a students' conference, "We produce university graduates. We are switching off production until our pay dispute is settled."

The decision to take this action was passed by an overwhelming majority of the university AUT branches represented at the March meeting. Of the 76 delegations present, 72 voted in favor of the action, one against, and three (Oxford, Imperial College, and University College, London) abstained. A smaller majority, in a separate action, voted to ac-

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In recent years, the OES malaise has attracted attention and caused concern in the upper echelons of the department. Top officials in the new Carter Administration were said to subscribe to the importance of science and technology in international affairs and to the need to strengthen OES, but no substantial changes occurred in OES resources or status during the past year.

There seems no question that occurrences such as the becalming of the Law of the Sea Conference and the crash of the Cosmos satellite have earned serious attention for OES problems at the top of the State Department. But the past has bred pessimism about good intentions.

The search has begun for a successor for Mink. Officials involved say they are pushing hard for an able replacement. Mink's resignation, however, is unlikely to make the quest any easier.

There has been a persistent view among some members of the scientific community that the problems of science at State would be solved if only a first-class scientist would take the job. Sterner analysts argue that what is needed most now is somebody who has a feel for scientific and technological issues, but above all knows how to operate successfully in the corridors and cul-de-sacs of power in Foggy Bottom.

French Science Policy—An Old School Tie

France's post-election shuffle of high ranking officials has brought back into government and into its top science policy post Pierre Aigrain, a scientist with a formidable transatlantic reputation and experience.

Aigrain, a physicist, has combined the holding of responsible jobs in French government science with an academic career in France and the United States. His most recent university stint in the United States was as Henry R. Luce professor of environment and public policy at M.I.T. in 1973–1974. At the time of his return to government service he was head of research and a vice president of

Pierre Aigrain

Thomson-C.S.F., a major French electrical and electronics manufacturer.

Aigrain's new post is that of Secretary of State for Research, which carries broad responsibility over science budgeting and organization. It is a cabinet post at the ministerial level and involves acting as science adviser to the government.

Predictions last winter that the parties of the Left would win the March parliamentary elections created considerable suspense in France. The result in government was that, by and large, French officialdom marked time in respect to both policies and appointments. Uncertainty in the science hierarchy was increased by the death during the winter of Bernard Gregory, head of the *Délégation générale à la recherche scientifique et technique* (DGRST), the principal coordinating agency for science and technology in France's highly centralized administrative system.

Gregory was regarded as a person of unusual ability and influence and his death left a serious gap in the government science structure. Knowledgeable observers say that Aigrain was appointed in the expectation that he has the qualities to fill that gap.

Aigrain's powers in his new post have been bolstered by giving him direct authority over DGRST, which in recent years has been attached to the ministry of industry. DGRST has traditionally been headed by a scientist, and the plan is to leave the top job open so that Aigrain will be the effective head, a sort of super *délégué générale* with ministerial rank.

Other changes in the scientific hierarchy include the appointment of the head of the French atomic energy commissariat (CEA), André Giraud, to be minister of industry, and promotion of his deputy at CEA, Michel Pecquer, to the top job in the agency. Both are well-known in this country by government and nuclear industry officials who deal with international nuclear matters.

Aigrain, 53, earned a Ph.D. from Carnegie Tech in 1948 and a doctor of science degree from the University of Paris in 1950. A solid-state physicist, his most recent work has been in semiconductors; he is the author of about 100 scientific papers and has taken out more than 100 patents. He is a professor of physics at the University of Paris (VII) and served as a visiting professor at M.I.T. 1957, 1959, 1961, and 1962 as well as in 1973–1974.

Although the French and U.S. governmental science systems are quite different, Aigrain's opposite number as science adviser is Frank Press, the President's science adviser. Ergo, Press, who came to the White House from M.I.T., and Aigrain, for what it's worth in terms of international understanding, are old faculty colleagues.

—John Walsh

cept a 10 percent pay increase. Correction of the pay anomaly to the full 12 to 14 percent most faculty members want would bring the average pay of a professor to £11,800 ($21,850), for example. However, if any gains are made, the lower 10 percent figure is more likely. (In Britain there is no such thing as associate or assistant professors; the corresponding grade is probably in the senior lecturer/reader region of the scale.)

The academic life in Britain has never been particularly well paid, but there is little doubt that pay scales have fallen behind corresponding salaries outside the universities. At the senior lecturer level, for example, an academic working in a polytechnic, probably less well qualified and dealing with less demanding work, might on AUT figures be around £250 a year better off, which is part of the problem.

The best salary comparison is probably with the scientific civil service, which works directly for the government in national defense and scientific laboratories. A chief scientific officer, corresponding to a university professor of experience and some scientific distinction, now makes around £13,000 ($24,000) including an award of 9.5 percent which came into force at the beginning of April. Although exact comparisons are difficult because the jobs differ and there is a range of salaries both in the universities and the civil service, comparison shows that in the upper reaches the civil service scientists are now between £2000 ($3700) and £2500 ($4625) a year ahead of their university counterparts.

Legitimate Grievance

The figures do suggest that the university teachers have a legitimate grievance, though whether their unorthodox tactics will force the government to remedy it will not be clear until the students begin taking their final exams. It may be that the action can be defeated by nonunion academics—the AUT claims an 80 percent membership in most universities, 60 percent in Oxford and Cambridge—or by outside examiners. There have been vague threats of legal sanctions against academics who refuse to mark finals papers, but the AUT feels that the likelihood of legal action is small.

In addition to the pay dispute, university teachers are also anxious about the general level of university support and in particular about the resources available for scientific research. This concern was brought into the open by the annual survey of the University Grants Committee, chaired by Sir Fred Dainton, a professor of chemistry at Oxford who has been concerned with science policy-making in Britain for the past decade. The UGC survey published figures showing that the universities' total income per student (that is, the total income from government grants and students' tuition fees divided by the number of students) had fallen by 6.9 percent over the past 5 years. The grant for equipment and furniture, which was £35 million ($65 million) this year, is not only seriously short of what is needed but has varied so much from year to year that the planning of an economical cycle of replacement has become almost impossible.

These two factors, combined with the difficulty of making further cuts in the universities (almost 90 percent of university income is now spent on items which cannot be cut, like staff salaries) has meant that the cuts have fallen particularly hard on the small remainder. As a result, the universities can no longer produce the "well-found" departments which are necessary if good research is to be done, the UGC concluded. Unless remedial action was taken soon, the decline of Britain's universities will not only accelerate but probably become irreversible, the survey warns.

A few weeks after the UGC survey appeared, the Department of Education and Science announced the university grants for the next year, together with provisional figures for the 3 years after that. (The days when university finance could be divided up into neat 5-year periods and the grants for the whole 5 years announced at once have long since been overtaken by inflation.) The grant for the 1978–1979 academic year is to be £619 million ($1145 million) plus £41.6 million ($77 million) for furniture and equipment. Although this sounds a healthy increase over the £553 million ($1023 million) granted for the current financial year, direct comparison would be misleading, the DES says, because "each grant is on the price basis appropriate to the academic year." However, even allowing for this, the figures were seen as a modest revival in the universities' fortunes and the forward projections for the next 3 years (£635 million in 1979–1980, £648 million in 1980–1981, and £670 million in 1981–1982, all expressed in 1978–1979 prices) confirmed the trend.

The figures were, in any case, a very great improvement on those published a year before. But perhaps predictably, since in announcing the grants Williams said nothing about correcting the pay anomalies, the AUT was lukewarm. John Akker, deputy general secretary of the AUT, said that he did not believe the grants would arrest the decline of the universities identified by the UGC.

The grants from the UGC are not intended to finance all the research done in British universities. They pay salaries and overheads, and maintain the fabric. Research grants, in the main, come from the research councils. Here too the past 5 years have been tough.

The Science Research Council, in particular, has been forced to make some severe economies. "If you're short of money you just have to cut something out," says Sir Sam Edwards, chairman of the SRC during this period. What he cut out was the British space program and the domestic high energy physics program; a stark decision, he admits. As a result, the SRC came out in "fairly good shape," he believes, with more money to spend on small science. A similarly tough examination of priorities by the universities would, he says, enable them to weather bad periods more effectively. He quotes the case of a major British university which is losing an outstanding research worker, who has reached retirement age, for lack of £10,000 a year to keep him on for a few more years. "Yet that university handles tens of millions of pounds a year in grants and other income," he says. "What commercial concern with that sort of turnover would let a key man go for lack of £10,000?"

Although many vice-chancellors would probably share Sir Sam's unsentimental view, few have the determination or the political power to maneuver out unproductive or incompetent academics so as to provide more money for the others. Universities can hire, but they cannot fire; and while job security may be a necessary component of academic freedom, its maintenance makes it difficult for universities to respond robustly to difficult times.

Universities may, by now, have weathered much of the storm of the past 5 years, as indicated by small increases in research budgets. And the Prime Minister acknowledges that "retrenchment cannot go too far." Yet problems remain.

In the end the fortunes of the universities depend on those of Britain herself. The economic situation is better, but not yet good. If it continues to improve, and the benefits filter down to the universities, then it is likely that science and scholarship generally will survive almost unscathed. But if the world and British economic prospects worsen significantly, permanent damage may be done. The next 2 years could be decisive.

—NIGEL HAWKES