U.K. Earth Sciences: Some More Equal Than Others?

A scheme for "rationalizing" earth science departments is generating controversy; other fields nervously await their turn

WHEN RONALD OXBURGH, professor of mineralogy and petrology at the University of Cambridge, was asked 2 years ago by Britain's University Grants Committee to come up with a scheme for rationalizing university earth science departments, the solution he produced was straightforward.

Oxburgh proposed that departments be placed in one of three categories with differing sizes and functions. Sophisticated research resources would be concentrated in a relatively few large departments. Others, somewhat smaller, would conduct some research but concentrate primarily on teaching honors students. And a third category would teach only first- and possibly second-year undergraduates.

The scheme had an obvious logic. But it came under immediate attack in the universities, where many saw it as the thin end of a wedge creating a clear hierarchical distinction between research and teaching departments, and perhaps eventually between two types of university.

Oxburgh's proposals raised alarm in fields far removed from the earth sciences, for similar reviews of other disciplines are currently being carried out by the UGC as part of a strategy aimed at increasing the concentration and selectivity of teaching and research resources in Britain's universities (*Science*, 18 March, p. 1371). The effort reflects government demands on universities that they should look for more cost-effective ways of using limited research and teaching resources.

The UGC has now responded to the criticisms of Oxburgh's proposals with its own scheme for rationalizing earth science departments. The UGC's plan, announced in its final form last month, accepts Oxburgh's premise that a concentration of resources is needed if Britain is to remain internationally competitive in the field. One result is that dedicated earth science activities are to be phased out from almost one-quarter of the 34 universities where the subject is currently taught.

However, rather than Oxburgh's proposed three "levels," the UGC has decided to adopt the more egalitarian concept of a "spectrum" of departments. There will be two main groupings: M (for mainstream) departments, conducting substantial research and teaching activities; and I (for interdisciplinary) departments, also responsible for both teaching and research, and "seen as equivalent in academic status to type M."

Furthermore, departments placed in each of these two categories will be divided into two groups, with the first group containing departments of "particular strength and potential" which will be allocated greater student numbers by the UGC. In addition, there will be some smaller J departments, offering joint honors and service teaching, and P (for postgraduate) departments, carrying out postgraduate teaching and research in specialist fields (see chart).

To some, the resulting two-dimensional matrix is little more than an attempt to blur distinctions that will inevitably exist in practice. "The feeling was that level two status under the Oxburgh system would have been the kiss of death. Students would have voted with their feet, and would quickly have seen where the best degrees came from," says one observer.

Earth science activities are to be phased out from almost one-quarter of the 34 universities where the subject is currently taught.

Gilbert Kelling, professor of geology at the University of Keele and chairman of the Committee of Heads of University Geology Departments, which carried out its own review of the reactions to Oxburgh, says "Where we differed fundamentally from the Oxburgh report was in the premise that you had to make a hard and fast division between different types of department according to their commitment to research. . . .We supported the idea that you must keep research and teaching indissolubly linked. That led us to the notion that what we were looking for was a spectrum of departments, grouped according to size and range of activity, but without a clear-cut hierarchy." That conclusion heavily influenced the UGC's ideas.

The Oxburgh committee's report draws partly on U.S. data gathered by the National Academy of Sciences in the late 1970s on American earth science departments to justify its conclusion that "university resources in the earth sciences are spread too thinly."

A comparison of student and faculty in the two countries showed that "the size distributions are not dissimilar in the two countries except that the U.K. has relatively fewer 'large' departments, that is, with staffs in the 25 to 35 range and research student populations of more than 30." It adds that the academy's report found that "it is in this 'large' range that the five most highly rated U.S. institutions fall."

Some continue to criticize the UGC's endorsement of Oxburgh's support of a "big is beautiful" principle, arguing that an excessive concentration of resources on large and well-established centers could stifle the creativity of members of smaller departments.

"There are admittedly some questions in the earth sciences that can only be tackled by large research groups," says John Allen, professor of geology at the University of Reading—a department that will have most of its undergraduate teaching taken away under the new reorganization. "But the creation of new knowledge always depends on individual creativity; the idea that you have to be in a big department to do creative research is something that many people find disturbing and false.

Also contested is the extra weight that appears to have been given to performance in basic, as opposed to applied, research in deciding which university departments should be placed in which category. Several universities feel in particular that they have been penalized for their efforts to establish links with the private sector, particularly the oil and mining industry. The geology department at Imperial College, London, for example, which is one of the largest and best known in the country, has only been placed in the group 2 category of I-type departments—a decision that will mean a loss of 80 out of 250 "full-time equivalent" student places and 10 teaching staff.

The rector of Imperial College, Eric Ash, has written a strongly worded letter to the UGC protesting the downgrading of the college's geology department, claiming that "a predominantly applied department has been judged against the legitimate, but here largely irrelevant, criteria of pure science."

UGC officials acknowledge that there "may have been a tendency" for applied geology departments to lose out in the review process. But they say that this was because their primary concern has been to ensure that all departments that remain—including those emphasizing applied disciplines—maintain firm roots in basic research.

The biggest outstanding issue, however, and one which appears destined to play an even more important role in future decisions about university physics and chemistry departments—both disciplines are currently under review by the UGC—is the extent to which individual departments should be evaluated in isolation from their institutional context.

"Many vice-chancellors are concerned that the review was carried out primarily at the departmental level, and not enough attention was paid to the interaction between earth sciences and other subjects," says Michael Powell of the Committee of Vice-Chancellors and Principals.

Partly in response to such criticism, the UGC has now announced that its reviews of chemistry and physics departments—both of which are widely expected to result in proposals to concentrate teaching and research resources, with perhaps the closing down of some weaker departments in both subjects—will be decided in close consultation with each other.

Physicists, for example, are already planning a defense against excessive rationalization by claiming that the elimination of a physics department in a university could have an impact on the perceived status of engineering or computer departments in the same institution.

"I think there would be general skepticism in the engineering profession toward the graduates of institutions that did not teach physics," says Derek Martin, professor of physics at Queen Mary College, London. Martin is chairman of a committee that has produced a report for the Institute of Physics warning that concentrating future expansion on the largest physics departments could threaten the existence of smaller departments in half of Britain's universities—and that this would be a "calamity."

■ **DAVID DICKSON**

A Fuel Shortage in Space?

The explosion of a rocket fuel factory in Nevada on 4 May has created a "serious problem" that may bring on "substantial shortages for the next 2 to 3 years," according to Terry Dawson, a speaker at a recent symposium held by the Congressional Space Caucus. Several experts were on hand on 17 May to discuss transportation issues. The potential fuel shortage will tighten the already narrow margins of the U.S. space program.

Dawson, a staffer for the House subcommittee on space science and applications, said the loss of the Pacific Engineering and Production Co. plant in Henderson, Nevada, cut in half the U.S. capacity to make ammonium perchlorate, the oxidizing agent used in most solid rockets.

Another speaker, Major General Thomas Moorman, director of the Air Force office of Space Systems, confirmed that an inquiry has begun on the size of the looming shortfall. The Air Force chairs a committee that will rank users by priority and allocate supplies.

Ordinarily, the military would not take second place to anyone in a rationing scheme. But Moorman reassured the group that the Pentagon is aware of the needs of scientific and commercial missions. An effort will be made to share the pain equally. "This is not the top problem in space," Moorman said, "but the one we seem to be spending the most time on."

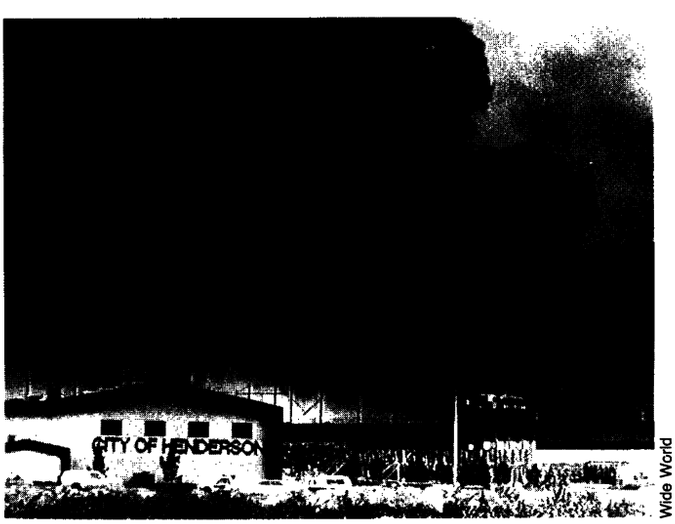
The crunch will not be felt immediately because rocket companies keep enough fuel on hand to last 6 months to a year. For example, Morton Thiokol, maker of the solid rockets for the shuttle, reports that it has supplies to last through a major ground test and four shuttle flights. But if production is not increased, Thiokol and other users will feel a pinch next year.

The Pacific Engineering factory was totally destroyed, killing two people and injuring 345. The company had planned to produce 20 million pounds of ammonium perchlorate this year, and the only other U.S. supplier, the nearby Kerr-McGee Chemical Corp., planned to produce 32 million pounds. Kerr-McGee's factory is located near a densely settled area. After the explosion, residents and the chemical workers' union leaned on state officials to close the Kerr-McGee plant pending a safety check. Bowing to public sentiment, the company shut down on 12 May and agreed to pay for an independent review.

The results came in on 26 May and, according to Henderson City Manager Gary Bloomquist, they were not favorable. The company was criticized, among other things, for failing to store chemicals properly and not having markers on the shut-off valves for the gas and ammonia lines. Kerr-McGee spokesman Paul Reed says that all the necessary changes can be made in a "matter of days rather than weeks." Bloomquist is skeptical.

The Air Force expects Kerr-McGee to receive a clean bill of health in early June and resume production. Reed says the company can increase output to 40 million pounds "without a great deal of heartburn." Even so, it probably will not be able to take up the slack fast enough to avoid a shortage next year.

Meanwhile, the accident has focused attention again on the shuttle's limitations as an all-purpose vehicle. It takes about twice as much ammonium perchlorate to launch a tracking and data relay satellite (TDRS) aboard the shuttle as on a Titan rocket. However, General Moorman said that it would not be a good idea to shift cargoes at this point. Remaking satellite hardware to fit other launchers would be expensive, and the change would play havoc with existing schedules. Most Titan rockets have already been spoken for. ■ **ELIOT MARSHALL**



Wide World

Burning rocket fuel *blackens the sky over Henderson, Nevada, as half the ammonium perchlorate capacity in the United States goes up in smoke after a fatal accident.*