

impermanence, illiteracy, uneven quality, and lack of considered judgment. Preprint publication differs from the more conventional kind, however, in that authors expect to publish twice, and that disputes over issues such as priority must be settled by reference to the chairman of the group concerned, and not by looking in the library. It would be good to know how the IEG chairmen would seek to deal with offenders who claim that they habitually throw their preprints away. It is proper to record that PIE is potentially more dangerous than IEG, because the names of those with access to the system would not be known to the organizers. It is probable that both systems, in their present forms, are more of a threat to the continuing health of scientific research than a fair wind in its favour.

But if not preprints, then what? The defects of IEG and PIE are no excuse for hiding from the problems which stimulated their emergence. One of these is the speed—or lack of speed—which attends publication in the orthodox journals. It is entirely proper that scientists should wish to see their work published as quickly as possible. The wish to establish priority is, or should be, only a small part of the reason for asking that publication should not be long delayed. It is much more important that the exchange of ideas is an essential part of science, and that the rapid exchange of ideas makes science more alive. Obviously there is a lot which orthodox journals should and could do to make publication faster, by better organization, the use of new printing processes and even of the telephone. Any way in which computers and data processing systems can help to make the literature more manageable and more accessible is obviously a deserving cause. It would be entirely in order if the institutions in the United States now being asked to lavish support on preprint circulation were to spend a fraction of the sum required on helping the journals to become more efficient.

There remain a number of nasty qualitative problems. Journals seek to be discriminating, and in part their reputations depend on how well they succeed. There is evidence that, in the past, the influence of the continuing criticism by the journals of what is eventually published in the literature has itself been an important formative influence in science. It has encouraged thoroughness and measured judgment. It has discouraged triviality and repetitive work. But the question now arises of whether the literature is not ripe for some much more drastic transformation. Much of it is hard to read. Much of it is less effective a means of communicating ideas and information than it could and should be. And, of course, there is too much of it. These characteristics of the existing arrangements for publication need careful attention by the scientific professions as a whole. If the National Institutes of Health are as well disposed towards the cause of effective publication as they seem to be, they could do a lot to help. The energy they choose to dissipate in Dr. Albritton's print-shop will be much less valuable.

## CENTRES OF EXCELLENCE

OLD soldiers never die, and it is much the same with laboratories. Professors Richard Post and Marshall Rosenbluth, two members of the University of California, have drawn attention to an interesting and important problem by speaking out in defence of the Culham Laboratory they have been visiting in Britain. Quite properly, they say that the laboratory is a splendid place "unexcelled in the world". They go on to hope that the kind of basic research carried out at Culham will not be restricted as a result of the British Government's wish to use its substantial effort in research and development as a means of helping the economy move forward faster. What they do not say is that the Culham Laboratory was formed at a time when there were fond hopes of turning thermonuclear research to most spectacular practical results, and that its present concern for more academic work—which includes the development of the first ESRO satellite at a cost of £3 million pounds—reflects the recognition there has been that plasma physics is not child's play. The laboratory has done well to survive, let alone to become a centre of excellence.

It remains a real question to ask how Britain should make full use of Culham and of other laboratories which pursue academic—in the sense of uncommercial—ends but which are not incorporated into universities. Professors Post and Rosenbluth are probably right in saying that too crude an attempt to divert academically minded men into other pursuits would persuade a great many of them to emigrate, but in itself that is not an overwhelming argument. If the British Government is persuaded that academic plasma physicists contribute nothing to the economy, in its present mood it would probably be glad to say goodbye to those who do not wish to change their ways. The difficulty, and the real cause for anxiety, is that activities which seem purposeless on a short time-scale can be enormously important in the long run. This is where too crude a decision could be dangerous and there is a possibility that, in its anxiety to balance the books, the British Government will make the pendulum swing too far against research as such.

It is inevitable that laboratories such as Culham will be the first to feel this pressure. It will be interesting to see how they stand up to it. Trying to define how the investment made in them may eventually be returned should be a healthy exercise. To argue that a pool of skill must be maintained is sensible, though not overwhelming by itself. (Undertaking contract work for ESRO, in which Britain is the principal partner, is not a convincing reason for survival.) The ideal would be if these laboratories could find some way of being much more closely integrated with universities, for then they would be able to claim with justice that their activities were at least helpful in educating students. The schemes which exist for taking postgraduate students at these public laboratories are not a sufficient answer to this need.