Libraries which tends to suggest that for a university of 3,000 students the cost of library services should be more like 6 than 4 per cent. This is probably a good rule to which to work, at least in this period when the new library technologies are still more like promises than realities. Whether the UGC will be allowed to live by it is another matter.

If the universities are likely to be in agreement among themselves on costs, the chances are that the proposals on central planning will be more closely looked at. The committee suggests two separate developments. First, it wants to see a hierarchy of advisory committees working to the Department of Education and Science and responsible for the continuing review of policy for libraries in science, the social sciences and the humanities. Second, it wants the library part of the British Museum to grow into what is called the British National Library, with responsibility for the organization of loans (at present the responsibility of the National Central Library), the maintenance of catalogues (for which the British Museum is ideally suited) and for the conduct of research.

These are jobs which need doing, everybody will agree. But the immediate difficulty is that of knowing how best to link the functions of co-ordination and making policy with the necessarily executive function of a national library. There are obvious dangers in the kind of separation which the UGC committee has in mind. To interpose a government department between those who give advice and those who must act on it is always a great hazard. In the circumstances, it could easily be much better to endow the British National Library with the functions of a research council, able to make policy for itself and equipped with funds for supporting research in libraries of all kinds.

FASTER AND COLDER

THE controversy about the temperature of a moving body which has erupted in *Nature* on several occasions since last November (see page 1105) may sometimes promise to become comparable with what is called—or miscalled—the clock paradox. Certainly both controversies have their roots in special relativity. Both of them seem also to be so well provided with logical imprecisions that ingenious minds are able to invent new lines of argument at least as quickly as they are refuted. Sometimes it seems as if the Schoolmen are at work again, counting the angels on the point of a needle. But the clock paradox is well served with experimental evidence. Measurement shows quite unambiguously that faster mesons live longer. The argument about the temperature of a moving body is less accessible to experiment, though it should not be scorned on that account.

It is, of course, entirely proper that somebody should ask what are the implications for thermodynamics of the kinematical transformations of special relativity, and, as it happens, Einstein was the one who recognized, in 1907, that there is a problem to be solved. His first attack was to generalize the thermodynamic definition of temperature in terms of entropy in such a way as to include uniform and possibly relativistic motion of a system as a whole. In practice this implies that the energy due to the motion of the centre of mass of the system must be added to the thermodynamic internal energy of the several parts of which it is composed. By a plausible analogy with conventional, or static, thermodynamics, Einstein convinced himself and those of his contemporaries who were concerned that the temperature, like physical dimensions and velocities, is not invariant under Lorentz transformation. Indeed, this argument concludes, the thermodynamic temperature of a moving system will seem to be less than if it were at rest in a ratio given by the familiar factor $\beta=\sqrt{(1-v^2/c^2)}$. This view that a moving body must appear cool has since been supported by arguments based on Lorentz transformation of molecular velocities and calculations about the frequencies of black-body radiation from a moving source. One way and another, it would seem, a moving body should appear colder than when it is at rest.

These conclusions have now been questioned by Professor P. T. Landsberg (*Nature*, **212**, 571; 1966), and there is clearly a long way to go before all the participants in the controversy will be satisfied. For one thing, there are physical and intuitive objections to the notion that temperature should change from one frame of reference to another. One of Landsberg's arguments, for example, is that the temperature of a body is a statistical concept involving the relative motions of molecules, so that the uniform motion of the centre of mass should make no difference. There is a particularly neat example to show how the flow of heat between two bodies moving relatively to each other could seem to two different observers to be in opposite directions. But he also argues that in constructing analogies between conventional and relativistic thermodynamics, it is possible to manipulate the algebra in such a way that temperature comes out as an invariant.

Not everybody is satisfied with this, which is entirely understandable. Detailed arguments about the correct way of transforming molecular velocities or radiation frequencies in a moving body are full of intricacy but also frustrating. One obvious difficulty is that the straightforward kinematics of relativity applied to the velocities of an assembly of molecules in internal equilibrium does not yield another distribution which is recognizable as another Maxwell distribution. In other words, there are doubts about the freedom with which the concept of temperature can be handed from one frame of reference to another. This is what Professor J. H. Fremlin was getting at when he wrote (*Nature*, **213**, 277; 1967) that "the whole concept of the apparent temperature of a moving body needs some physical consideration before any mathematics are employed at all". Luckily, that could be an entertaining exercise.