

looked. But he has done well to provide such an eloquent reminder that if the British feel badly about the comparison with the United States, less prosperous nations are likely to feel even more unhappy.

## RIBONUCLEASE

THE article by Dr. David Harker and his colleagues which appears on page 862 carries further the discussion of the tertiary molecular structure of ribonuclease. The fact that the team at Buffalo has been working on this problem has, of course, been common knowledge for some time. In spite of all the successes of the past few years, however, deriving the shape of a large protein molecule by X-ray analysis is still an exacting and a lengthy task. The difficulty is that an unambiguous identification of the positions of the atoms does require a sufficiently detailed analysis for individual atoms to show up on an electron density map. Sometimes, of course, a close similarity between two protein molecules may mean that information about one helps with understanding the other, but that does not often happen. This is why it was good to read in several newspapers in January that Dr. Harker's group had acquired a good head of confidence in their description of the ribonuclease molecule. At the same time, an article by Dr. C. H. Carlisle and his collaborators from Birkbeck College, London, was on the way into print in *Nature*. Now that both models have been published, it is plain that they differ from each other in several important ways. The fact that Dr. Harker's analysis implies a resolution of 2 Å, while Dr. Carlisle's is equivalent to 5.5 Å, will naturally make the American model seem the more convincing. One possibility, for example, is that Dr. Carlisle's model will come to seem more like Dr. Harker's as the analysis continues. Alternatively, further detailed study may suggest more radical changes to be necessary. These are not matters which can be decided lightly, but only by well-informed appraisal of whatever evidence may be available. It may be a great help that there is a third group, at Yale, working hard and quickly on the problem.

There remains the question of what these great endeavours are intended to accomplish. The fact that ribonuclease turns out to have the same general shape as the protein molecules the tertiary structure of which has already been determined, with hydrophobic groups inside and hydrophilic groups outside, is, of course, important if no longer surprising. But each new example of tertiary protein structure is bound to be a further help in the attempt to understand how tertiary structure is determined by the overall arrangement of amino-acids. The special interest of ribonuclease is that there is only one other enzyme molecule—lysozyme—the tertiary structure of which has been determined with accuracy and confidence. Obviously there will now be hopes that a comparison of the two enzyme molecules will provide clearer pointers

to an understanding of how enzyme molecules function than would be possible if there were just one model to work with. Unfortunately it is a long time since there were expectations that the sight of an accurate tertiary structure would indicate quite quickly the seat of its biological activity.

## WHAT NOW, APOLLO?

THIS is a critical time for the future of piloted space flights in the United States. Congress has at last begun picking over the budget of the National Aeronautics and Space Administration for the coming financial year. The process is more uncertain than usual because it is not yet clear how radically the space agency will be required to change its plans for the immediate future to prevent a recurrence of the kind of trouble which killed three astronauts on January 25. The signs are not, however, encouraging for the optimists. The third and most substantial report of the Board of Inquiry into the accident at Cape Kennedy, issued last week-end, has some ominous passages about complacency and miscalculation. Mr. James Webb, the chief executive officer of NASA, has openly acknowledged that the risk of fire was underestimated. It would not be surprising if Congress now took a cooler view of the urgency of sending men to the Moon than has previously been its custom. But healthy scepticism this year is likely to be particularly influential, if only because the foundations for the continuing programme of the NASA are going to be laid this year and the next.

What should a good committee man do? First of all, he is likely to ask how much the Apollo trouble is likely to affect the programme now mapped out by the White House for what is called the Apollo Applications Programme intended to occupy the early seventies. Briefly, the intention is to capitalize on the investment there has so far been in the family of Saturn rockets. In this scenario there are to be one or two flights each year by people to the Moon, and more frequent journeys by instruments to the planets. Optical telescopes in orbit about the Earth, with real astronomers in attendance, are included in the plans. But all this may now seem dangerously ambitious. Congress may choose to counsel caution. It would certainly be wise not to commit NASA to a specified level of expenditure without more information about the viability of the system for breathing oxygen in Apollo. Whether, in all this, the Air Force Project for a "Manned Orbiting Laboratory" will seem to be tarred with the same brush as Apollo because it has a similar oxygen system, or whether it will seem an attractive alternative, is not at this stage clear. And it is always possible, of course, that the Board of Inquiry will eventually have a hopeful tale to tell. But whatever happens, this is a valuable time for Congress to strike a blow for moderation in the exploration of space by people.