NEWS AND VIEWS

Basic Questions about Moon still in Doubt

NOBODY really expected the lunar samples to solve all the problems of the solar system in one swoop, yet it is surprising how little basic understanding of the Moon has been revealed since Apollo 11 nine months ago. This was clear at the NATO Advanced Study Institute on the Moon and Planets which began at the University of Newcastle upon Tyne last week.

It is true that a vast amount of raw information is available in the form of 120 pounds of rock and soil returned so far. There is also the information produced by the instruments left behind on the surface of the Moon, although nobody knows quite what to make of the seismometer results. And on top of the information obtained at first hand there are the data from a decade of unmanned probes to the Moon, culminating in the Surveyor and Orbiter series in the late 1960s.

But basic problems such as the nature of the interior of the Moon and the forces which moulded the lunar surface are still open to vigorous discussion, as the Newcastle conference is demonstrating. And, as well as the failure to answer the questions about the Moon and the solar system in general which have always been a puzzle, the space programme has set further problems which the samples have so far failed to answer. Nobody would have it otherwise, of course.

The concentrations of mass under some of the ringed maria, which close analysis of the paths of spacecraft in orbit around the Moon has revealed, are one example. Another is the nature of the soil which blankets the parts of the Moon visited so far to a depth of metres. It seems clear from the composition of the soil that it could not have been created by the grinding up of the igneous rocks which have been found on the Moon, including the anorthosite which is suspected to be the chief component of the highlands. The age measurements—$4{\cdot}65 \times 10^9$ years for the soil compared with a range of $3{\cdot}59$ to $3{\cdot}93 \times 10^9$ years for the rock samples—also argue for the uniqueness of the soil and are a further obstacle to a simple explanation.

Naturally enough, the discussion centres on the nature of the interior of the Moon, and here the mass concentrations are taken to be the primary clue, although the weak magnetization of the samples is an important indicator seeming to imply that the Moon once had a conducting liquid core.

Much depends on the extent to which the gravity maps produced from the Orbiter data are to be trusted, but it seems that the contours are more like what would be expected if the mass is concentrated in plates under the maria than the prediction for spherical bodies buried under the surface such as slow-moving meteorites might conceivably produce. This is a question which requires the tracking of spacecraft in low altitude orbits which are more susceptible to gravitational inhomogeneities than the 100 km orbits of the Lunar Orbiter series. This is something for later Apollo missions. If the mass is indeed concentrated into plate-shaped structures, then this is a strong argument in favour of the view that the gravity effects can somehow be explained in terms of the evolution of pools of lava. Yet some people believe there is a problem in accounting for the way in which the mass is supported, and suggest that this implies a cold lunar interior. The evidence for molten material at the surface must then be explained by a process such as heating by the Sun during an early superluminous phase.

The question which is beginning to surface in people's minds is whether the exploration programme which has been laid out to 1974 is going to supply the information to solve the problems which are still outstanding. It may be that material from the diverse sites which have been earmarked for exploration will throw a new light on the data which have so far been accumulated purely from landings in the maria. There is the possibility of picking up material from deep within the Moon which has been thrown out by meteorite impact, for example. This must be what people are hoping, if the fundamental questions about the nature of the Moon are to be answered.

Mapping the RNA Phage

MOLECULAR biologists, always in pursuit of new clues to the mechanisms of protein synthesis, are at present very excited about RNA bacteriophages. This enthusiasm springs from the remarkable ease with which the *in vivo* situation can be mimicked in the test tube when these viruses are used. A flood of recent articles has been concerned with the nucleotide sequences of the genes themselves, the structure and function of the punctuation signals between the genes and the ways in which the translation of one gene may control the translation of others by causing changes in the secondary and tertiary structure of the RNA. On page 230 of this issue of *Nature*, Jeppesen, Steitz, Gesteland and Spahr report the first unambiguous determination of the order of the genes of phage R17.

RNA phages code for three proteins, phage coat protein, maturation (A) protein and RNA synthetase enzyme. Because there is no genetic recombination between RNA phages, it is not possible to map their gene order by conventional genetic analysis. Attempts