mixed strategy, with some interest in immediate applications and some in the more distant future. Then, too, it would be easier for the institute to diversify its structure, by forming closer links with a university or with a teaching hospital. Perhaps the most serious lack in the discussions of the past few months has been that of an exploration of alternative structures. But that, of course, is what new directors are for. Everybody will wish Professor Symington luck.

LUNAR SCIENCE

Apollo 12 springs Surprises

from our Astronomy Correspondent

IT now seems certain that the samples recovered from Oceanus Procellarum are sufficiently similar to those from Mare Tranquillitatis to prevent any heart searching, yet different enough to whet the appetite for more. The ages of the rocks from Oceanus Procellarum, for example, seem to be 500 million to 1,000 million years less than the 4,000–4,500 million years for the Tranquillitatis samples, which compare with the 4,700 million years estimated for the age of the Solar System. Something like 34 kg was returned by Apollo 12, half as much again as from Apollo 11. According to preliminary reports from Houston, there is far less dust in the Apollo 12 collection—half of the Tranquillitatis sample was material finer than 1 cm—and there are forty-six rocks up to 4.9 kg in weight. They include a specimen of about 0.7 kg with an unusually coarse-grained appearance which is suspected to be impact debris originating from deep within the Moon, possibly excavated from Copernicus 200 miles away. The other rocks range from fine-grained to coarse-grained. Only two of them are breccias, a much smaller proportion than from Apollo 12, although to what extent the distribution of rock types is a subjective effect of the astronauts' sampling technique is not known at present. Chemical analysis shows that the rocks tend to have less titanium than the surprisingly rich Tranquillitatis material, but they contain more iron.

More staggering this time than the sample analysis are the data from the package of experiments left behind on the Moon. It now looks as if it will take several months and a large amount of computer time before the surprising results of the crashdown of the upper stage of Intrepid are interpreted (*Nature*, **224**, 836; 1969). Estimates of the impact are narrowing down to a TNT equivalent of one ton, trivial by the standards of seismologists. Yet the disturbance at the seismometer took five minutes to build up, and about an hour to decay with a period of one second. On Earth such behaviour would be unthinkable, first because the terrestrial disturbance would have disappeared within a few minutes and, second, because the periodicity would have been longer than one second. It seems probable, however, that the trace is more likely to be explained by the overall structure of the Moon than by the resonance of a hypothetical underground structure.

It is also surprising that the magnetometer left behind should have registered a lunar magnetic field between 30 and 40 gamma, when 2–3 gamma were what was expected (1 gamma is 10^{-5} gauss, so that the strength of the Earth's field at the equator is

35,000 gamma). The question people will be asking is what this implies about the lunar interior and whether it can be interpreted in terms of remanent magnetism in the lunar rocks. Clearly a network of magnetometers would help to pinpoint the field, and this will be one of the aims of future missions.

People are now looking forward to Apollo 13, scheduled for lift-off at 1528 EST on March 12 next year, when the landing will be on a completely different kind of surface from the maria sampled so far. The site is at $17^{\circ} 36'$ west and $3^{\circ} 48'$ south in the highland region of the Fra Mauro formation, about 110 miles east of the Apollo 12 site. Nobody knows what to expect, except that the landing site is likely to be the most rugged so far. This is why the separation from the command module will take place at the lowest altitude yet to allow the lunar module more fuel to manoeuvre. Meanwhile lunar scientists will be going over the results from Surveyor 7 which landed near Tycho two years ago to become the only Surveyor in a highland area.

ENRICHED URANIUM

Go-ahead for Centrifuge Project

THE jigsaw puzzle of the British nuclear fuel policy took a step nearer completion last week with the news that Britain, West Germany and Holland have approved the terms of an agreement to do with collaboration on the centrifuge method of enriching uranium. This is not the same as signing the agreement. Before this can be done it has to be vetted by Euratom under Article 103 of the Euratom Treaty which lays down that any agreements between members and non-members of Euratom—and Britain is not a member although West Germany and Holland are—have to be approved by the Euratom Commission. But nobody is expecting any objections and when the agreement is signed the exchange of technical information between the three countries can begin. The announcement means, of course that the extension to the gaseous diffusion plant at Capenhurst, which is the traditional and (largely because of its electricity consumption) the less economic method, will not now be built. The next part of the jigsaw to fit into place is the British nuclear fuel company which the Minister of Technology, Mr Anthony Wedgwood Benn, promised as long ago as July 1968 would be hived off from the Atomic Energy Authority. The Bill establishing the company is to be presented to Parliament in the New Year.

Last week Mr Benn was making no secret of the fact that the negotiations for the centrifuge agreement had been long and extremely difficult. They began just over a year ago with a meeting at the Hague which started a round of speculation about the magnitude of the economies which the centrifuge process will achieve as well as about the political implications of West Germany's participation which the announcement has done nothing to stop. All Mr Benn will say about the selling price of the enriched uranium is that it will be competitive with the American product.

Initially the agreement allows for plants at Capenhurst and at Almelo in Holland with each plant able to do up to 50 tonnes of separative work per year by 1972, later going up to a total of 350 tonnes per year. West Germany has been consoled with the design and construction headquarters. The plants at Capenhurst