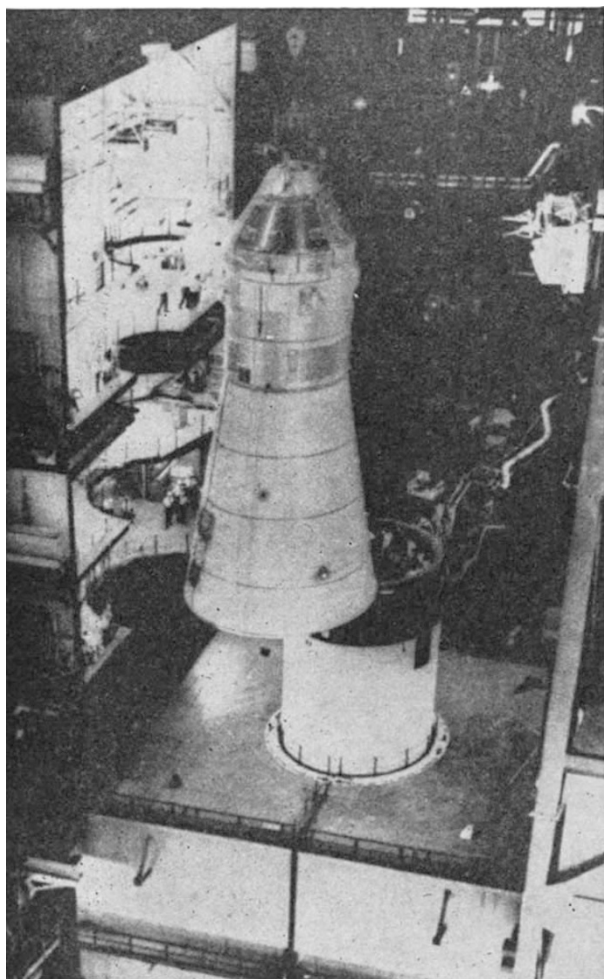


Thorium Ltd is aware that the advance which is the foundation of their present success could any day be followed by another advance which unseats them. The company is therefore planning to diversify. It still finds a ready sale for thorium oxide in gas mantles, chiefly in the Far East.

## ROCKETRY

### Space Race Hots Up

WITH a sigh of relief, the United States last week launched the first manned Apollo spacecraft—a series which, with luck, will culminate in a manned landing on the Moon next year. Although last week's launch was in essence planned many months ago, it will be seen by Americans as an answer to the Russian achievement only three weeks earlier of sending the Zond 5 probe on an orbit around the Moon and its recovery in the



Indian Ocean. With the recent resignation of NASA's chief administrator, Mr James Webb, and the cuts in NASA's spending which triggered off the resignation, the latest Russian effort caught NASA by surprise. If all continues to go well with Apollo 7 after what seems to have been a virtually flawless launching, American hopes will be uplifted.

Meanwhile, conjecture about what the Russians were up to when they launched Zond 5 continues. In

*Science* last week (162, 245; 1968), Merton E. Davies, of the RAND Corporation and Bruce M. Murray, of the California Institute of Technology, argued that Zond 5 may have as much significance as the precursor of an entirely new and sophisticated type of unmanned planetary probe as it has as a test for a manned flight around the Moon. Their conclusion is based on an article by Professor A. Dmitriyev, reported in *Red Star* and in *Pravda*, which praised Zond 5 as a major advance in space technology relevant to the exploration of the planets. This was because the study of planetary surfaces requires the delivery to scientists on the Earth of detailed photographs and the like which could be seriously distorted if transmitted by radio. Zond 5 was therefore intended to develop ways of returning information from space directly to laboratories on the ground—a task which, Professor Dmitriyev wrote, was successfully completed. Davies and Murray add that a drawing of Zond 5 published with the article together with a verbal description lends weight to their argument. The spacecraft had large solar panels reminiscent of those on earlier Russian planetary probes, and was fitted with a very large high-gain antenna more in keeping with a planetary than a lunar probe. Because of this, Davies and Murray expect the Russians to launch a Mars probe similar to Zond 5 on the next favourable occasion, which will be during late February and early March.

Most American space scientists have nevertheless regarded Zond 5 as a threat to their aspirations to land on the Moon first, even though there was no indication during the flight of Zond 5 that the Russians yet have the capability of doing anything more than a manned circumnavigation. But because the conventional interpretation seems to be that such a Russian manned flight is imminent, the Americans are hoping to stretch the next Apollo flight (Apollo 8), scheduled for December, to include a trip around the Moon. A flight including ten lunar orbits is technically feasible, circling the Moon at a height of about 110 km. Much depends on the interpretation the acting administrator of NASA, Dr Thomas Paine, puts on the success of Apollo 7. Following Apollo 8, two further Apollo flights are planned before the attempt at a lunar landing by Apollo 11, late next year if all goes well.

## WEATHER COMPUTERS

### New Machine for Bracknell

THE Meteorological Office at Bracknell is in the market for a large computer, several times faster than Atlas, for delivery in the early 1970s. For a cost which is expected to be about £3 million, the Meteorological Office hopes to buy a machine which will speed up the process of numerical weather prediction forecasts for a larger area and make the forecasts more detailed. So far, the operational requirements of the new system have been drawn up and an order will probably be placed with one of the five principal manufacturers of large computers early next year.

Since 1965, the Meteorological Office has had an English Electric KDF 9 computer, which recently has been operating for virtually 24 hours a day. The Atlas computer at the Science Research Council's computer laboratory has also been used for experiments on numerical weather prediction. This involves

the numerical solution of equations describing the motion and heat balance of the atmosphere when values from meteorological observations are substituted. In this way, the way in which conditions in the atmosphere will change for a day or two ahead can be forecast. For a forecast extending only 24 hours into the future, however, 8 hours of computing time on Atlas are needed. The results have been encouraging, the Meteorological Office says, but, to put this work on an operational footing, a really large computer is needed.

One of the five manufacturers which the Meteorological Office sees as suppliers of its new machine is International Computers Limited, the company formed in March this year by International Computers and Tabulators, English Electric and Plessey. Presumably the latest machine from ICL—the 1908A—announced in August and available in a form having up to twenty times the power of Atlas, will be one of the chief contenders. The other four firms are American, and whether the Meteorological Office will be allowed to buy from them when a British machine is available is an open question. The philosophy at Bracknell just now is to go ahead with the sounding of the British and American manufacturers and see what happens.

#### ROAD SAFETY

### Health on the Roads

IN the future, British automobile drivers may have to be medically screened when they apply for a licence if a memorandum from the British Medical Association is approved by the Ministry of Transport. The BMA proposes that the application forms for driving licences should include questions about illnesses or absence from work lasting more than six weeks during the previous ten years and when the licence is renewed drivers would have to disclose illnesses since the licence was last granted. In certain cases, the medical adviser to the local licensing authority would approach the hospital or the patient's family doctor for more information about the driver—the driver would have to give his assent to his doctor for these disclosures to be made at the time the application was made. Elderly drivers who wear spectacles may be asked to produce a certificate from an ophthalmologist.

Local authorities, according to the memorandum, would have discretion to decide which drivers needed a medical examination and could refuse to grant licences in certain cases. Drivers would, however, be allowed to appeal against this ruling, and the BMA proposes the setting up of regional medical panels to deal with doubtful or disputed cases.

The idea for medical screening of drivers was broached at the annual meeting of the British Medical Association in June this year. The Private Practice Committee of the association then set out a scheme and this was recently approved by the BMA council and sent to the Ministry of Transport.

Little is known about the relationship between physical disability and the causation of road accidents, and the *British Medical Journal* (October 12, 69; 1968) comments that it is "unlikely that many more licences will be refused than are at present. As the body of information accumulates, it should be possible to correlate accident rates with diagnostic categories,

and in time a policy could be developed which is supported by reliable scientific evidence". The Ministry of Transport is meanwhile considering the memorandum in connexion with the revision of licence application forms in association with the introduction in the 1970s of a central system for driving licences and vehicle registrations.

#### MINING ENGINEERING

### Saving the Lost Tin

THE Science Research Council announced last week that it had awarded a grant of £14,638 over the next three years to a nuclear physicist, Professor G. F. Powell of Bristol University, to support research into improvements in methods of extracting tin from its ores. All this may sound a most unlikely combination, but the grant is a small example of the SRC's new policy of preferentially increasing support to applied research (see page 216 of this issue). In fact the grant is going to support Dr C. R. Burch and Mr R. Mozley at the Wills Physics Laboratory, who have, since 1965, devised a machine which improves extraction of cassiterite (tin oxide) from crude ore and which is already saving one of the two remaining Cornish tin mines about £50,000 a year.

The development of this machine is an example of the sort of project which is likely to become increasingly common now that the SRC is turning to applied research and the NRDC has a realistic budget. In 1965 Mr Mozley, a mining engineer, joined Dr Burch, then two years away from retirement, as his research assistant and immediately began building a prototype ore concentrator at the Geevor tin mine near Land's End. Crude tin ore contains about one per cent cassiterite and much of this is lost with the conventional gravity concentrators, which cannot recover particles less than  $50\mu$  in diameter. Mr Mozley had an idea how to improve recovery, but, as he says, it is no use trying to change the ways of traditionally minded mining engineers by showing them models, and so from the outset he had to build a full scale prototype. The machine worked; it recovered particles down to  $5\mu$  in diameter and increased overall recovery from about 79 per cent to 81 per cent. That may sound not very much, but with tin costing £1,300 a ton it makes a great difference to the profit of a mine. In fact the Geevor mine was so pleased with the machine that it built six copies of the prototype and the NRDC gave £2,000 for further development, took out patents and has sold a licence to a company to build commercial models. These are finding a ready market with the companies which are reworking the waste tips of a number of Cornish mines that closed in the 1920s.

The SRC came into the act this year because, like many successful inventions before it, no one is quite sure how the Mozley-Burch concentrator works. The SRC balked at the prospect of providing funds for building prototypes of an improved version, saying, quite properly, that that is the province of the NRDC with which renewed negotiations are under way, but it has provided £14,000 to support work on the physical principles of the concentrator. As far as is known, Bagnold forces are probably responsible for its success. A 1 mm thick film of crushed ore, suspended in water, flows over a large flat surface of resin bonded fibre glass