

inflation in the years ahead. That should make possible a sensible programme. A more serious need is that NASA should be provided with more effective means for defining objectives as it goes along. Where basic science is concerned, for example, it would probably have been possible to avoid some of the mistakes of the past few years if NASA had been more closely in a relationship with the scientific community. Some of the Biosatellite experiments would have had a poor showing if they had been put through the kind of intellectual mill to which academic research proposals are usually subjected, and is it really sensible to go looking for magnetic monopoles in samples of moon dust recovered from the Moon this week? In this field, as in others, the President's advisers could do a great public service by helping to provide NASA with a wider base in the rest of the community. Such a move should also be more acceptable now that the immediate task has been accomplished.

Implications of Spaceflight

So does it follow that NASA must become—as many other public organizations are—the prisoner of a network of advisory committees? That is the wrong end of the telescope. There is no reason why the organization should not be strengthened as it is changed. Having made space possible, as it were, somebody must now show what it is for. Much of the past criticism of the way in which things have been done stems from the willingness with which NASA has echoed the surprisingly irrational declaration with which President Kennedy declared that there should be a journey to the Moon. The trouble is that the recipe will not work more than once. What is to take its place? Much of the pleasure in the first successful landing has stemmed from the hope that it will now be possible to change the perspective with which familiar terrestrial problems are regarded. Will this be true? Will it now be easier for rival nations to sink their differences, for example? Will disarmament be easier? Will poverty, national and international, now be less respectable? History provides no solid ground for thinking that the pendulum will now swing right over. The most cheerful precedent of all may be the discovery of North America, for there, after a long interval which is almost best forgotten, there did emerge an enlightened means of government, that which has made it possible to build the Apollo programme. So can the builders now give substance to the hope that this is also a turning point in history? Dr Paine has been talking of the ways in which the doings of his agency may be able to spread all kinds of benefits elsewhere in the world than the United States, and it is plainly the case that European science has been helped along significantly by what has happened in the past few years. For many people, however, the acid test will be the extent to which it is now possible to work out some kind of collaboration with the Soviet Union. One gigantic programme of exploration may be justifiable, but two can only be a kind of folly.

Dr Paine is also the most intelligent spokesman so far for the belief that the arrival of spaceflight will work an intellectual transformation comparable with revolutions now attributable to Columbus, Galileo, Newton and Darwin. There may be much in what he says. Certainly there is no denying that developments like these can profoundly alter the character of intellectual life. Certainly, it would be dangerous at this stage to dismiss everything that has been happening as a futile prank—a way of spending large sums of public money. It is too soon to know. Yet there are some influences which argue that spaceflight is rather a part of an intellectual revolution than an entire revolution on its own account. It will be a long time before the range of the spaceships catches up with the boundaries of that part of the universe of which there is already an understanding of sorts. It may be different when the first discovery is made of living creatures on some other planet, whenever that may happen. To say all this is not to crab spaceflight but merely to assert that it is one of those developments whose influence will depend on the use which is made of it. Nuclear energy is in the same case, although spaceflight has the advantage that there are no obvious military applications. No one can deny that Armstrong and Aldrin have given the enterprise a splendid start, but it is only a beginning.

MOON ANALYSIS

Enzymes at Houston

ONE unexpected beneficiary of the Moon Show was Smith Kline Instrument Co., whose 'Eskalab' clinical chemistry system has been chosen by NASA for analytical work associated with Apollo 11's lunar samples. This news seemed to have come as something of a surprise to Smith Kline itself when it was first released a few weeks ago.

There are several clinical chemistry systems available now for the analysis of blood glucose, serum enzymes and the like, and they range from automated monsters which look after themselves for hours to the conventional trio of spectrophotometer, technician and pipette. Smith Kline's 'Eskalab' is somewhat nearer the latter end of the scale, but it embodies several new features. The company believes this instrument commended itself to NASA because, first, it is small and can easily be sterilized and operated in a vacuum chamber and, second, because it is flexible and can be changed from one assay to another in a matter of seconds.

Optically, the 'Eskalab' system comprises a solid state spectrophotometer, an interference filter as monochromator, a double light beam generated by a chopper mirror and an extended range photomultiplier tube. All this is fairly conventional, and the novelty resides in the way the basic spectrophotometer has been adjusted to the needs of a hospital laboratory. Specially formulated reagents, cuvettes and pipettes come in a package deal with the machine, and together they take the Principle of Disposability to new lengths. The reagents come as stabilized tablets, one tablet per test, while the Lucite cuvettes—transparent down to

300 nm—and the self-filling micropipettes are designed to be used once and then thrown away. Thus chances of contamination are cut down and speed of operation is increased. A built-in dry well incubator uses a thermistor to maintain a temperature accuracy of better than 0.1°. Every mixing operation and cuvette manipulation is done manually, which may put the machine at a disadvantage with its several automatic competitors now on the market. But its makers claim they would back it against any automatic spectrophotometer in a contest of pure speed.

The machine currently at Houston seems set for fame. No doubt some enthusiast at NASA will put some moon dust straight into a cuvette in the forlorn hope of finding a lunar enzyme, but more serious experiments will be the measurement of biochemical parameters in the collection of animals and plants that is to be exposed to lunar material. The machine has been available in the USA for several months, and is said already to have made a fair impact on the market. The mood of practising doctors in Britain seems to be running somewhat against enzyme assays just now, at any rate for purposes such as the diagnosis of myocardial infarction. But improved assays are under development, and it remains to be seen how the British hospital market will be divided by the current generation of clinical chemistry systems.

QUATERNARY STUDIES

Motorway into Ice Age

EXCAVATORS preparing the motorway south of Birmingham uncovered a thick layer of ice age peat on Friday last week. Members of the geology department at the University of Birmingham, who salvaged the peat from the maw of the bulldozers, hope that it will provide a mine of information about part of the Pleistocene history of Britain, the period of ice ages which may have ended some 10,000 years ago.

The geologists were prepared for the discovery because of preliminary boreholes dug more than a year ago. The boreholes, part of the standard prospecting for a motorway that will link the M5 and M6, revealed thick layers of peat and silt. Another borehole was sunk by the Institute of Geological Sciences in the thickest part of the layer, and a core removed which probably spans some 50,000 years of deposits.

Dr F. W. Shotton, professor of geology at the University of Birmingham, says that the core has not yet been studied or dated but that it may belong to the Hoxnian interglacial, the last but one of the warm interludes between glacial advances. The Hoxnian interglacial occurred some 200,000 years ago.

This much was known before the motorway intersected the peat layer last week. Spruce cones and seeds of the water chestnut, a species now extinct in Britain, have already been identified. A Hoxnian deposit was discovered north of Birmingham some years ago but the interest of last week's finding is that the deposit apparently covers a complete cycle of climatic change, being sandwiched between layers of clearly glacial debris. Professor Shotton, in whose department the peat will be studied, hopes that the peat will afford a full history of the climatic and biological events that ensued between the retreat of one glacier and the advance of its successor.

TROPICAL MEDICINE

War on Amoebae

AMOEBIASIS must count as one of the world's major remaining diseases. It is estimated to affect 10 per cent of the population, though its prevalence runs as high as perhaps 80 per cent in Egypt and 56 per cent in Ecuador. A WHO congress on malaria in 1958 emphasized the importance of the disease, and in the intervening years fair progress has been made in its epidemiology and chemotherapeutics. A WHO Expert Committee met in Teheran in 1968 to assess progress, and the report of this meeting has just been issued (*Amoebiasis: WHO Technical Report Series*, No. 421, Geneva, 1969: 6s).

Six species of amoeba are known to live in the human colon, but *Entamoeba histolytica* is the only species known to be pathogenic in man, and it is now recognized as the organism behind such conditions as amoebic dysentery, amoebic colitis, amoeboma and amoebic appendicitis. The WHO committee recommends that all these clinical states should be subsumed under the generic title amoebiasis. The presence of *E. histolytica* cysts in human faeces used to be regarded as proof that there had been lesions in the colon mucosa, but this belief has now been abandoned. *E. histolytica* can in fact pass through the human gut inoffensively, and the events—presumably enzymic—that lie behind the onset of pathogenicity are at present not understood.

The encysted amoeba enters new human hosts through their mouths, but it is hard to disentangle the specific epidemiological importance of factors such as contaminated water, food handling, flies, direct faecal contact, overcrowding and the use of night-soil as a fertilizer. New serological techniques are proving useful in the diagnosis of the disease, but perhaps the most hopeful aspect of the situation at present is the appearance of safer and more effective amoebicide drugs.

Drugs that have been familiar in the treatment of amoebiasis for some decades now include quinoline derivatives acting in the bowel lumen; antibiotics, which act in the bowel lumen and wall; emetine, which acts in bowel and liver but is fairly toxic; and chloroquine, which acts in the liver but again can have unpleasant side effects. Two nitroimidazole derivatives have recently been pressed into service, however, and they show powerful activity against amoebae at all their bodily foci. Of the two, metronidazole, already popular in the treatment of trichomoniasis, is the better tolerated.

ANIMAL FOODSTUFFS

Analysing for Prophylactics

METHODS for the analysis of prophylactic additives to animal feeding stuffs are the latest addition to the Pesticide Residue Analysis Information Service, established in Britain by the Ministry of Technology in 1965 at the Laboratory of the Government Chemist. The service answers about 250 enquiries a year on methods of analysis for residues of pesticides and their principal degradation and metabolic products.

Prophylactic additives include substances such as amprolium and nitrofurazone as well as the conventional antibiotics. They are added to animal feeds in