

## NEW WORLD

# Exploration from the Sky

ON Sunday this week, NASA launched the first of its Earth Resources Technology Satellites (ERTS-1) into a polar orbit lying between 561 and 570 miles above the Earth. There seems no doubt that the satellite is the most sophisticated of all data handling and data processing laboratories to have been put into an Earth orbit so far. But it is widely regarded by sceptics and cynics alike not so much as the first opportunity to harvest information about the surface of the Earth by remote control but, rather, as the first opportunity to test NASA's claims in recent years that Earth resources satellites are potentially even more profitable than telecommunications satellites.

ERTS-1 will function in two ways. First, it will collect data about local conditions relayed from 150 points on the surface of the United States by as many ground-based automatic sending stations, equipped to record such measurements as rainfall, snowfall, temperature, soil moisture and wind velocity. Second, the satellite is equipped with three television cameras sensitive to distinct spectral frequencies as well as with a four-channel spectral scanner recording light intensity, with a resolution of 80 yards, in the green, red, near and far infra-red regions of the spectrum. The total weight of the satellite (on the surface of the Earth) is 1,800 pounds and the technology of the device owes much to the development of the Nimbus meteorological satellite in the past few years.

The problems of data handling are of several kinds. If the resolution of the four-channel sensor were to be 100 feet—and the performance of the instruments in ERTS-1 is less good than this—the recovery of all this information would require the transmission of more than 200 megavits per second of information to the Earth. As well as the multispectral sensor, however, ERTS-1 is equipped with three television cameras which will between them produce some hundreds of thousands of television pictures each day. Storage within the spacecraft, which will be accomplished by magnetic videotape, is itself a problem, but S-band communication channels are also of limited capacity, and ERTS-1 will transmit merely 60 megavits per second.

NASA has made arrangements with groups of investigators in more than 30 countries to have access to the information collected by ERTS-1. Although it will be possible to identify in principle

the fields of individual farmers in the images collected, identification will to some extent be complicated by the departure from circularity of the orbit achieved last week. And although, at a conference organized by the Panel on Science and Technology of the House Committee on Science and Astronautics earlier this year, several visionaries looked forward to the time when the visual skills of the photogrammetry experts would be replaced by automatic comparisons of photographs, for so long as NASA and its helpers are trying more specifically to define what Earth resources satellites should look for, there will be no escape from visual comparison.

The immediate benefits of the Earth resources satellites are not easily foreseen. Plainly they will be objective tests of the long-held dream of the meteorologists that it will be easier to collect information about the weather by means of satellites. There should also be a useful yield of information about macroscopic questions—how much of the Earth is really covered by forest, or by snow? The television cameras will provide plenty of grist for the mills of those who would apply in civil fields what the military intelligence people have been doing, all these years, with the photographs returned from the surveillance satellites. Synoptic geology of out-of-the-way places should be stimulated (but in the last resort there may be no substitute for the man with a hammer). And the oceanographers have been promised a chance of learning much more than they know at present about such things as the distribution of plankton near the surface.

### SICKLE CELL ANAEMIA

## Programme in Progress

PRESUMABLY as a foretaste of things to come, the Department of Health, Education and Welfare has announced the award of \$9 million to boost research and community service on sickle cell anaemia. This money comes out of the funds made available for fiscal year 1972, after President Nixon's call in his health message to Congress in February 1971 for a \$5 million increase over the \$1 million already being spent, and the subsequent addition of a further \$4 million. The improvement should continue, for the National Sickle Cell Anaemia Control Act, signed into law by Mr Nixon last May, authorizes the expenditure of \$25 million in fiscal year 1973, \$40 million in 1974 and \$50

million in 1975 (see *Nature*, **234**, 377; **237**, 68; 1972).

The activities that are to benefit from the awards come under the auspices of the National Sickle Cell Disease Program, set up in response to the President's health message, and coordinated by Dr Rudolph Jackson, a haematologist who also heads the Sickle Cell Disease Branch of the National Heart and Lung Institute. All aspects of the battle against the disease are intended to benefit, and the \$9 million is to be distributed between nineteen screening and education clinics, ten comprehensive research and community service centres and thirty-four pure and applied research projects. The clinics will provide screening and detection facilities, as well as counselling and education programmes for 10,000 to 20,000 people each per year.

Haemoglobin S, which is responsible for sickle cell anaemia and was first described in 1949, can be detected by an electrophoretic test. Thus diagnosis is easy, and distinguishes between sickle cell anaemia (the homozygous condition) and sickle cell trait (the heterozygous condition, when there are no severe symptoms but the offspring are at risk of inheriting the disease). An important aspect of the work of the clinics will therefore be to counsel prospective parents.

In the United States, sickle cell anaemia affects chiefly the black population, and there are some fears that genetic counselling represents a form of genocide, although such fears are obviously groundless because counsellors are trained not to tell people whether they should or should not reproduce but to advise them of the possible consequences. To allay these and other fears will be a vital part of the educational activities of the clinics, which are to share about \$2 million of the awards.

The research and community centres, which share about \$4.5 million, are intended to combine fundamental research and clinical application with community services. Because sickle cell anaemia is genetically determined there is no cure, and clinical research is concentrated on improving methods of treating the painful crises that afflict the sufferers. Dr Jackson was confident last week that the programme which he is coordinating will decrease the frequency, morbidity and mortality of sickle cell anaemia in the United States—this, he says, is not genocide but rather "genosave".