need for the second enzyme in this sequence; DNA polymerase in its endonuclease capacity could do its job as well as synthesize the new segment of DNA. Once the first enzyme had located the mismatch and cut the chain on the 5' side, DNA polymerase could polymerize the correct nucleotides, adding them on to the newly exposed end working in the 5' to 3' direction. When the polymerase reached the first Watson-Crick base pair of the original double helix—in other words, when it has filled the mismatched gap—it could excise the original segment of mismatched DNA. After that, DNA ligase could sooner or later displace DNA polymerase and covalently bond the last of the newly added nucleotide to the remainder of the chain and complete repair.

RADIO BACKGROUND

Astronomy in Earth Orbit

from our Astronomy Correspondent

RESULTS are beginning to appear from the first satellite designed with radio astronomy in mind—Radio Astronomy Explorer I launched on US Independence Day last year. The advantage of satellite radio astronomy is, of course, that signals can be picked up in space which would never penetrate the Earth's ionosphere. Roughly speaking, anything below about 10 MHz cannot reach the ground, and ground-based observations at frequencies up to several tens of MHz are likely to suffer from interference reflected by the ionosphere. RAE-I orbits at 5,850 km, well above the ionosphere, and its receivers are tuned to nine different frequencies between 9.2 MHz and 450 kHz. To pick up signals it has three aerials—two V-shaped aerials with the open end of one V pointing radially outwards and the other V pointed at the Earth, so that the two aerials form an X with the body of the spacecraft at the centre, and a dipole aerial which is always at a tangent to the orbit. The aerials are not small. Each limb of the two V aerials is 229 m long, and the dipole is 37 m.

Only results from the dipole are used in a paper from the Goddard Space Flight Center which describes the cosmic radio background between 0.4 and 6.5 MHz (J. K. Alexander *et al.*, *Astrophys. J. Lett.*, **157**, L163; 1969). The authors have found that the spectrum peaks at about 3 MHz, and this is interpreted in terms of absorption by ionized hydrogen in the Galaxy. Their data refer to the northern part of the orbit, which has an inclination of 59°, when the dipole is receiving signals from near the galactic north pole. This part of the sky is not prominent at higher frequencies, and it seems to have been chosen because in the northern part of the orbit the electron density in the vicinity of the satellite is lowest, which means that the data here are most reliable. Alexander *et al.* say that the errors in their intensity measurements are about ± 18 per cent.

Because of the way the spectrum falls off, especially below 1 MHz, Alexander *et al.* think that an absorbing screen between the Earth and the sources of radiation cannot be responsible. Rather it seems that the sources must be immersed in the ionized hydrogen absorber. In particular, the results can be inter-

preted in terms of two sources of radio background—one is the galactic plane and the second, weaker, component is isotropic. Below 1 MHz the isotropic component is negligible because of absorption. The picture of the interstellar gas which has been deduced in the past few months from pulsar observations is apparently consistent with the RAE-I data. People will be looking forward to promised analyses for other parts of the sky, and to the low frequency maps which the more directional V aerials will produce.

PLATE TECTONICS

Support from Lead Analysis

from our Geomagnetism Correspondent

NEWTON has demonstrated (*Nature*, **224**, 314; 1969) that the interdisciplinary approach to geophysics is most important. Geochemical and petrological evidence, in particular, has played an increasing part in recent geophysical theory—even in areas, such as geomagnetism, where it might be least expected. Geologists, of course, have long recognized the usefulness of geochemical and petrological indicators, just as geophysicists are beginning to appreciate this sort of evidence in connexion with their tectonic theories.

A good recent example is the support that lead isotope analysis has given to the theory of plate tectonics—in particular, the underthrusting of the Pacific Ocean rigid plate beneath the Japanese island arc. Kuno (*J. Petrol.*, **1**, 121; 1960; and other refs.) recognized that the volcanic rocks of the Japanese islands comprise three distinct petrographic provinces. The Pacific side of the islands is a tholeiitic province, the Japan Sea side is an alkalic province, and there is a high-alumina basalt province between the two. Kuno's explanation of this distribution was based on the gradual change from oceanic mantle to continental mantle in the east-west direction beneath Japan. Specifically, he concluded that the different magmas were derived from different depths—tholeiitic magma from the upper 150 km, high-alumina basalt from 150 km to 200 km and alkalic magma from below 200 km.

Tatsumoto (*Earth Planet. Sci. Lett.*, **6**, 369; 1969) now offers a rather different explanation, based on an east-west survey of the isotopic composition of the Japanese volcanics. What he finds is that the proportion of radiogenic lead decreases along an east-west traverse while the ratios of ^{238}U to ^{204}Pb and ^{232}Th to ^{204}Pb increase in the same direction. The radiogenic lead data alone could be taken to support Kuno's hypothesis. If, when the mantle differentiated, a vertical zonation resulted such that uranium was concentrated relative to lead in the upper parts of the mantle, the trend of the surface radiogenic lead could indicate that alkali basalt is derived from deeper than the tholeiite. But the variation of the ratio of ^{238}U to ^{204}Pb does not correspond to the radiogenic lead trend—the ratio is too low to support the proportion of radiogenic lead in tholeiite and too high to support it in alkali basalt. There are several possible explanations for this discrepancy, all based on the preferential extraction of various elements at various depths; but it is difficult to decide between them. Tatsumoto, however, points out that Japanese tholeiite contains significantly more lead than abyssal tholeiite, which