atomic use. Another source is the mineral baddeleyite, also known in Travancore sand.

Graphite of a high degree of purity, especially free from boron, is required in the atomic reactor but is rarely found in the natural state. With four petroleum refineries in the country treating over 3½ million tons of crude oil yearly, there should be enough petroleum coke available for manufacture of artificial graphite.

Prospect for the Future

The vast extent of India covered under ancient crystalline rock formations, both in the Deccan Peninsular shield and the extra-Peninsular region of the north, particularly the Himalayan terrain, yet remains to be examined for its uranium potential as well as resources in ancillary atomic minerals. The million square mile Archæan and pre-Cambrian rock expanse, with its cover of basic lava flows in the north-west (many of which are known to have measurable content of uranium of the order of 10^{-6} gram per gram of rock), is covered only in comparatively insignificant proportions by systematic geological prospecting and survey for uranium. So far the Himalayan region has hardly been touched by these surveys. The Himalayas are regarded as generally barren in sizable mineral or metal veins or lodes. Its very recent orogeny and the observed poverty of this region of middle and late Tertiary uplift in metallogenic provinces has influenced this attitude amongst Indian geologists. But large areas of the inner Himalayas are yet geologically *terra incognita,* and need to be investigated by aerial geophysical surveys, especially in the central and axial parts of the range which are marked by a series of granitic and gneissic intrusions of immense sizes.

A planned programme of investigating these areas by ground and aerial surveys has been formulated, and the strength of the geological and physical personnel engaged in the Raw Materials Division of the Atomic Energy Department is being gradually increased.

It would be hazardous to predict any large accessions of uranium and thorium from these hitherto unknown regions; at the same time the prospect of discovering many commercially workable uranium deposits in new fields cannot be ruled out.

THE ANTIPROTON

SINCE the discovery of the positron by Anderson, confirming Dirac's prediction on the basis of his theory of the electron, it has been generally assumed that the proton would also have its charge conjugate, the antiproton, a stable particle identical with the proton in mass and spin and having charge and magnetic moment equal but opposite to those of the proton. It would be expected to be generated in pairs with ordinary nucleons and to have the ability to be annihilated in interaction with them.

Workers at Berkeley have now announced the identification of antiprotons (by mass determination from momentum and velocity measurements) among particles generated by bombardment of a copper target by 6·2 BeV protons from the Berkeley bevatron. A minimum energy of 5·6 BeV is required for antiproton production in nucleon-nucleon collisions. They measured the momentum (p) by an arrangement of magnetic lenses and fields which select negative singly charged particles with $p = 1{\cdot}19$ BeV/c; and velocity by a time of flight determination between two scintillation counters 40′ apart. About 250 particles, with average mass of 1840 ± 90 electron masses, were thus found. These were separated from the large number of accompanying π-mesons ($> 44{,}000$ per antiproton) of the same momentum (and hence greater velocity) by making use of the velocity sensitivity of Cerenkov counters. Existing observations on stability and interactions of the particles are consistent with their identification as antiprotons.

The existence of the antiproton entails with virtual certainty the existence of the antineutron. Its experimental demonstration is a most interesting problem. Probably the neutron beam of the Berkeley bevatron contains an appreciable number of them, but their disentanglement from the ordinary neutrons appears a formidable task. It is likely that the best approach will be either: (1) to transform an antiproton into an antineutron by a collision with a proton; or (2) to convert an antineutron into an antiproton by collision with an ordinary neutron and detect either the antineutron or the antiproton produced by this process.—(*Nature*, 1956, **177**, 11.)
