over 4000 miles. The rate of decay of electron density as a function of altitude provided new information on the density of the remote upper atmosphere, since atmospheric scattering was the dominant mechanism for loss of particles. Moreover, continuing observation of the thickness of the shell served to answer the vital question as to the rate of diffusion of trapped particles transverse to the shell. All of these matters were of essential importance in a thorough understanding of the dynamics of the natural radiation and were now the subject of direct study by means of the "labeled" electrons released from Argus I.

Throughout the testing period the planned series of firings of high-altitude sounding rockets was carried out with full success and with valuable results in the lower fringes of the trapping region.

Explorer IV continued to observe the artificially injected electrons from the Argus tests, making some 250 transits of the shell, until exhaustion of its batteries in late September, though by that time the intensity had become barely observable above the background of natural radiation at the altitudes covered by the orbit of this satellite.

It appears likely, however, that the deep space probe, Pioneer III, detected a small residuum of the Argus effect at very high altitudes on December 6, 1958. But the effect appears to have become unobservable before the flight of Pioneer IV on March 3, 1959.

The site of the Argus tests was such as to place the artificially injected radiation shell in a region where the intensity of the natural radiation had a relative minimum. If the bursts had been produced at either higher or lower latitudes, the effects would have been much more difficult to detect, plot, and follow reliably for long times after the blasts.

The immense body of observations has been under study and interpretation by a large number of persons for about seven months. Only now are satisfactory accounts becoming available from the participating scientists. From these observations we have learned, to cite by two examples: (i) There was no diffusion of electrons transverse to the electron shell since the thickness of the shell remained constant. Also traces of the shell persisted for many days and possibly weeks; (ii) Extrapolations of the earth's magnetic field into space, which have been based on surface measurements, were confirmed by the experiment. The experiment has made it possible to predict the shape and intensity of the earth's field with considerable accuracy out to distances of the order of several earth's radii.

The directness and clarity of the artificial injection tests have provided a sound basis for interpretation of the natural radiation trapped around the earth. It is likely that many important contributions will continue to arise from the great diversity of geophysical observations being conducted by other countries participating in the International Geophysical Year.

The IGY group of the National Academy of Sciences planned, as with its other program, to make the scientific results of Explorer IV available as rapidly as analytical procedures permitted. In view of the progress made by experimenters and analysts, the academy took steps more than a week ago to arrange for a presentation of summary papers at its annual meeting on April 27–29, 1959.

IAEA Head Says Member Nations Fail to Give Full Support

W. Sterling Cole, director-general of the International Atomic Energy Agency, has urged that his agency be allowed to perform the functions for which it was established. He says that the failure of nuclear powers to cooperate fully with the IAEA is hampering development of the atoms-for-peace program.

Background Cited

In a stirring address before the American Association for the United Nations, which met in Washington in March, Cole pointed out that the measure of success of a U.N. specialized agency is not so much in the efficiency of management of the organization itself as in the extent to which the supporting governments will actually use the international channels provided. Cole reminded the audience that when President Eisenhower made his atoms-for-peace proposal to the United Nations in 1953 which led to the formation of the IAEA, the underlying idea was entirely new. Cole commented: "For the first time in history it was proposed that a tremendous force usable for war and destruction be dedicated to the benefit of mankind everywhere and that knowledge in the peaceful application of this new-found force be shared without favor or discrimination."

Cole emphasized that the IAEA "constitution" is a treaty-statute approved by more than 80 nations. The agency's constituent assembly is an annual general conference of the member states, now numbering 70. Its managing directorate is a 23-member board of governors carefully balanced to include representation of the atomic-industry nations, the material-supply nations, the recipient nations, and the several major geographic regions of the world. He pointed out further that the agency has a staff of outstandingly competent scientists, engineers, administrators, and diplomats made up of representatives of more than half the member states.

Recommendations Offered

Cole summarized his recommendations as follows.

"The first decision which must be made is clear and straightforward. It is simply the decision that, having created an international body for defined purposes in connection with atomic energy, the Agency should be supported not only with generous financial contributions—as has been the case of the United States—but fully and without qualification in its operational aspects. We can be only partially effective if some nations maintain parallel machinery to do the same thing as the Agency but subject to individual nation selection, manipulation and control.

"Once this decision has been made, and with determination to sustain it, the subsequent steps become equally clear and straightforward: to discontinue further bilaterals or multilaterals [agreements], to begin to place under Agency administration the health and safety and materials safeguard measures embodied in existing bilateral and multilateral agreements, to begin to channel all atomic foreign aid through the Agency, and to start work on the instrument which will make possible the registration and accounting control of the nuclear fuel materials."

The United States has 42 bilateral and multilateral agreements with 40 countries, and one with the city of West Berlin, to assist in the peaceful development of atomic energy. Some 45,000 kilograms of U-235 has been set aside in accordance with these cooperation agreements.

This country has made 5000 kilograms of U-235 available to the IAEA and has promised to match the allocations of other countries. So far the United Kingdom has pledged 20 kilograms of U-235; the U.S.S.R., 50 kilograms. In addition, Portugal will provide 100,000 kilograms of normal uranium concentrate. The first purchase of nuclear fuel by any country through truly international channels was completed on 24 March, when Japan signed an agreement with the IAEA to buy 3 tons of natural uranium, provided by Canada, to be used in a 10-megawatt research reactor.

Antarctic Science

Albert P. Crary reported recently on his 2½ years in Antarctica as deputy chief scientist of the United States–International Geophysical Year program of the National Academy of Sciences. Crary has just returned from an assignment that also involved serving as station scientific leader at Little America. From that station, he led two major journeys of scientific exploration, the second ending on 1 February 1959.