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.

Great Distances Traveled

On these traverses, he covered a total of almost 3100 miles, an expanse of ice wider than the United States. Crary also led a 320-mile traverse in April 1958, which integrated his longer trips with traverses from Byrd and Ellsworth stations to give a continent-wide scientific picture of unprecedented scope. In all, U.S. traverses organized by Crary totalled 7500 miles, spanning Antarctica from the Weddell Sea to the Ross Ice Shelf and into the Victoria Land Plateau.

Crary's first major trek, from 24 October 1957 to 13 February 1958, covered 1450 miles of the Ross Ice Shelf. On the second journey, which began 15 October 1958, and lasted 108 days, Crary's party travelled 1629 miles.

Group Records Varied Findings

During the latter trip, the group climbed Skelton Glacier to a height of 7500 feet, placing markers which will lay the groundwork for the first accurate measurements of mass ice flow down the glacier. They worked their way up the glacier to the Victoria Land Plateau, and proceeded inland 400 miles on the plateau, finding ice 8000 to 9000 feet thick. Average annual temperature on the plateau was determined to be −55°F, almost as low as the −58°F average at the South Pole. This was found by measuring temperatures in bore holes drilled to depths of about 50 feet. At this level, temperatures are known to be about the same as the annual average at the surface.

Among their other findings was an ocean-bottom depth beneath the Ross Ice Shelf of about 4400 feet below sea level, at 79°06′S, 165°30′E. It was measured by seismic sounding.

Primary purposes of the most recent traverse were to determine the snow and ice characteristics and thickness on a line extending directly into the main Antarctic highlands and to study the Skelton Glacier and the transition from low-lying ice shelf to high plateau.

More than a dozen specific types of scientific observations were made by the party, which also included Charles R. Wilson, Washington, D.C., and Stephen L. Den Hartog, Concord, Mass., glaciologists; Lyle D. McGinnis, Kaukauna, Wis., seismologist; and Frank C. Layman, Pittsburgh, Pa., mechanic. Trevor Hatherton, chief scientist of the New Zealand Antarctic program, accompanied the party most of the way.

Methods and Equipment Used

They travelled in three Sno-Cats. The first of these tractor-type vehicles carried an electronic crevasse detector, navigation equipment, and radio. Another housed seismic, gravity, and magnetic equipment, while a third carried mess facilities. Three 2½-ton sleds were used to haul fuel and spares. The party was resupplied by ski-equipped aircraft from Navy Task Force 43, under the command of Admiral George Dufek, which provided extensive logistic support for IGY scientific activities.

Elevations of the surface along the traverse route were obtained by altimetry and transit levelling. Thickness of ice was determined by seismic reflection methods. Characteristics of rock under the ice were established by seismic refraction methods.

Primarily to obtain data on annual snow accumulation, observations were made to depths of 10 meters from shallow snow pits and bore holes. Snow hardness, grain size and shape, densities, and temperatures were noted.

Surface meteorological data were collected on temperature, pressure, wind speeds, wind direction, cloud cover, and cloud types.

Standard "station" stops were spaced at intervals of about 30 miles for snow-pit studies, seismic reflections, gravity and magnetic observations, and temperatures in 10-meter bore holes. Minor stations were made about every 5 miles for gravity and magnetic studies.

During the passage up the Skelton Glacier, the intervals were shortened to 5 and 2 miles for standard and minor stations respectively. In addition, three major stations were made at the foot and top of the Skelton Glacier and at the western end of the plateau line. There, seismic refractions were added, the drill holes were made to depths of 20 meters, and snow samples were taken for oxygen-isotope studies.

Britain's Department of Scientific and Industrial Research

Some years ago Great Britain decided to try financing its Department of Scientific and Industrial Research on a 5-year basis. The experiment, which was designed to meet the needs of long-term planning of research, has proved successful, and the government is continuing the system for another 5 years.

An outline of the second 5-year plan was presented in the House of Commons recently by Harmar Nicholls, parliamentary secretary to the Ministry of Works, speaking on behalf of the Lord President of the Council for Scientific and Industrial Research, Lord Hailsham, who is the minister responsible for the DSIR. As before, the financial provisions of the program are subject to the necessary funds being voted annually by Parliament and may be reviewed in the event of a marked change in the economic situation or of major changes in cost. Some of the chief features of the new plan follow.

The Plan

Expenditure on research by the DSIR will be nearly doubled in the next 5 years. For the period 1959–64, approximately £61 million will be made available to the department, compared with £36 million for the first period, which ends on 31 March 1959.

Expansion will continue steadily throughout the period, and for the year 1963–64 expenditure is expected to reach about £14 million. This figure does not include certain special items, the largest of which is the British contribution to the European Organization for Nuclear Research (CERN), which will continue to be financed outside the 5-year plan.

The largest expansion will take place in the field of scientific grants to the universities. Post graduate awards to students will be increased by about 10 percent each year until in 1963–64, it is hoped, some 3800 students will be receiving DSIR grants for research training. In the same year it is expected that DSIR support for special research in the research departments of universities will be operating on a scale of about £1¾ million per annum.

DSIR Laboratories

In support of additional research carried out in the department's own laboratories, expansion of staff at the rate of about 6 percent per annum—or approximately 30 percent over the 5 years—is included in the plan.

Grants to the research associations will also be increased to over £2 million per annum by the end of the period. At present there are 49 organizations in the DSIR scheme. The Council for Scientific and Industrial Research will continue its policy of encouraging industry to bear an increasing proportion of the total cost. It may be expected, therefore, that the actual expansion of the research association movement will be proportionately greater than the increase in government grants.

It has also been decided to devote much more attention and more money to insure that the results of scientific research are known and applied.

It is also proposed that the Ministry of Works increase its rate of expenditure on behalf of DSIR so as to provide buildings and equipment for the increased staff of DSIR laboratories.

U.N. Space Group

The first meeting of the United Nations Committee on the Peaceful Uses of Outer Space has tentatively been scheduled for the second half of April, according to the *New York Times*. The committee, which consists of 18 government representatives, was established by