

reactance. Prof. Sayers also showed a *Skylark* nose-cone instrumented with an ion spectrometer of unique design. This spectrometer is a pulsed ion chamber of 2,000 cm.² aperture. It is ejected from the rocket on a long flexible cable so as to avoid contamination with rocket gases.

Probably the most dramatic and exciting discovery of the rocket and satellite programme of the International Geophysical Year has been Van Allen's work with the *Explorer* satellites, now corroborated by *Sputnik 3*. The discovery of the Van Allen belt, as it has come to be called, was made with *Explorer 1*, the Geiger counters of which were soon saturated with the intense radiation. To amplify the results from *Explorers 1* and *3*, *Explorer 4* was instrumented with two scintillation counters (one plastic and one caesium iodide) and two Geiger counters (one shielded). It was launched at an inclination of 51° and the results were recorded on magnetic tape, read out on command.

That the radiation belt reached a maximum intensity of more than 10,000 counts/min. at about an Earth's radius above the equator was confirmed by *Pioneer 1*. *Explorer 1* showed evidence of a connexion between the intensity and auroral activity (and therefore solar streams). *Explorer 4* indicated in addition the presence of a more penetrating component than the auroral electrons.

It was suggested that the radiation is largely due to solar ionized gas trapped in Störmer orbits. A rough computation of the relaxation time of the ionization gives 10⁷ sec., far too long for auroræ to result directly from influx into the belt. It is suggested that the auroræ are due to leakage from the belt along the lines of magnetic force and that the increase at the advent of a solar stream is due to deflexion of the lines of force, analogous to a squeezing of the reservoir.

Mr. D. G. King-Hele of the Royal Aircraft Establishment, Farnborough, presented his results from observations of the orbits of *Sputniks 2* and *3*. The irregularities in motion can be attributed to varying air density, the westerly wind of the Earth's rotation and the second harmonic of the gravitational field. The results show that changes in air density at perigee

are immediately reflected in change of time of meridian passage. The westerly wind causes a perceptible change in orbit inclination, while the rate of precession leads to an accurate estimate for the Earth's oblateness. If it is assumed that only the second harmonic of the gravitational field is significant, a new value of 1/298.16 is obtained for the ellipticity compared with 1/297.6. Mr. King-Hele was of the opinion that to this degree of precision it is permissible to ignore higher harmonics. No inconsistency arises in the results obtained from satellites of various inclinations when this is done.

Two papers were presented by Dr. Newell. In the first he reviewed some of the results from inboard satellite instruments, other than cosmic-ray measurements. In the *Explorers*, micrometeors had been studied by the microphone method and environmental measurements had been made. Soon it was hoped to launch satellites to study cloud cover, the terrestrial radiation balance and magnetic field. Some micrometeor results have come from non-orbiting *Vanguard*s. A flux of about 2.5 × 10⁴ kgm./day has been estimated but there are serious discrepancies with Soviet results.

The results on density obtained from rockets and satellites are consistent, figures of 2.8 × 10⁻¹³ gm. cm.⁻³ at 228 km. being obtained from air drag and 1 × 10⁻¹³ and 8.8 × 10⁻¹⁵ gm. cm.⁻³ at 260 km. and 355 km. respectively, from ion gauges in *Sputnik 3*.

Ionization shows a slow decline above the *F*-layer, and composition measurements using a radio-frequency ion spectrometer in *Sputnik 3* show the oxygen ion to be the predominant ion from 250 to 950 km. The ratio of N⁺/O⁺ at 230 km. was found to be 3.7, rising by a factor of two at about 700 km.

In his second paper, Dr. Newell reviewed the future of American research under the National Aeronautics and Space Act. The terms of reference include: (1) expansion of human knowledge of the atmosphere and space, (2) aircraft, (3) space vehicles, (4) long-range uses of space for peace, (5) co-operation with other nations. The programme planned amounts to a review of all the basic physical studies which have become possible now that space research by rocket vehicles has become a reality.

NEWS and VIEWS

Geological Society: Awards for 1959

THE Geological Society of London has made the following awards for 1959: *Wollaston Medal* to Prof. Pierre Pruvost, professor of geology at the Sorbonne, Paris, for his researches in stratigraphy and palaeontology, with special reference to his work on the Carboniferous rocks of Europe, and his stratigraphical investigations of the rocks of Brittany; *Murchison Medal* to Prof. S. E. Hollingworth, professor of geology at University College, London, for his contributions to stratigraphy, glaciology and geomorphology in north-west England and the Midlands; *Lyell Medal* to Prof. D. Williams, dean of the Royal School of Mines, for his contributions to geology, especially as applied to the discovery and exploration of mineral deposits; *Bigsby Medal* to Prof. B. C. King, professor of geology, Bedford College, London, for his contributions to the structure and petrology of Africa, especially of Nigeria, Uganda

and Bechuanaland, and to the interpretation of rock transformations, ancient volcanoes and metamorphic tectonics in Scotland; *Wollaston Fund* to Dr. M. H. P. Bott, lecturer in geology in the University of Durham, for his application of geophysical methods in the elucidation of geological structures and particularly the structure of granite masses; *Murchison Fund* to Dr. D. T. Donovan, lecturer in geology in the University of Bristol, for his work on Mesozoic stratigraphy, palaeogeography and palaeontology, particularly in regard to the ammonites; a moiety of the *Lyell Fund* to Mr. C. O. Harvey, chemist to the Geological Survey of Great Britain during 1934-58, for services in aiding geology by chemical analyses of rocks and minerals; another moiety of the *Lyell Fund* to Dr. W. H. C. Ramsbottom, of the Geological Survey of Great Britain, for his contributions to systematic and stratigraphical palaeontology, especially for his work on the Lower Palaeozoic Crinoidea and on Carboniferous faunas.