Reg. 10·6·26

THE EARTH'S ATMOSPHERE.

Newly Discovered Radiations.

Before the South Australian Astronomical Society, at the Institutes Association lecture room, North terrace, Adelaide, on Wednesday night, Professor Kerr-Grant, of the Adelaide University, lectured on "Newly discovered radiations in the earth's atmosphere." Professor R. W. Chapman presided.

The lecturer said that before 1895 the only sort of radiation known to exist naturally was light. In that year X-rays were discovered by Routgen in Germany, and shortly afterwards the spontaneous radiations of uranium and radium were discovered by Becquerel and Monsieur and Madame Curie in Paris. Both those types of radiation might have a penetrating power far exceeding that of ordinary light. For example, the most penetrating rays from radium could be detected even after passing through half an inch of lead. From investigations begun about the year 1900 by physicists in Europe and in America, it had been found that those penetrating radiations were everywhere present. They were detected by the ionisseffect on air of other gases. When attempts had been made to eliminate by surrounding the apparatus with a metal shield, it had been found that although they could be reduced they could not be entirely got rid of. The explanation usually given for that was that the shield itself contained minute quantities of radio-active substances. In 1904, however, it was found that these highly penetrating radiations were much more intense at a height of four or five miles than at the earth's surface, and the theory was put forward that they originated not in the earth or air, but in the space outside the earth—in other words, they were of cosmic origin. During the last few years that theory has been thoroughly tested by the work of the eminent American physicist, R. A. Millikan. In the first place he attached his recording electroscopes to balloons which carried them up to a height of about 10 miles. The results of those experiments showed that the penetrating radiation increased up to a height of five or six miles, and then fell off rapidly. Millikan has, therefore, been inclined to reject the hypothesis of cosmic origin. Later experiments, however, carried on at an elevation of 10,000 ft. on Mount Whitney, in California, had conclusively established the existence of a radiation so penetrating that it could be detected after passing through 6 ft. of lead. That radiation appeared to enter the earth's atmosphere at all times with the same intensity, and therefore from all directions in space.

The question of its origin remained unsolved, proceeded the lecturer. Its extreme penetrating quality made it improbable that it originated in any radio-active transformation, and Millikan took the view that only an actual transmutation of matter could supply sufficient energy for its production. He (Millikan) suggested that in certain stars the transformation of hydrogen gas into helium was continually going on, and that the radiation arose therefrom. Dr. Jeans, the most eminent living authority on problems of cosmogeny, had put forward the alternative view that the radiation might arise from the actual annihilation of matter by the combination of its constituent positive and negative electrons of which all atoms were ultimately composed. That annihilation Jeans regarded also as a probable source of the enormous amount of radiant energy. In most stars, however, he pointed out, it would be impossible for that radiation to escape from the interior. Only in very diffuse stars or nebulae could it emerge into outer space and so reach the earth.

Reg. 11·6·26

FLIGHT OF SEA BIRDS.

Observations of Professor Wood Jones.

Paper to Royal Society.

The flight of birds at sea is a source of never-ending interest. Observations by a man with the knowledge of Professor Wood Jones are always most entertaining, and the paper he read on the subject before the Royal Society, at its monthly meeting on Thursday night, was of a specially interesting character.

Professor Wood Jones, in introducing his subject, said it had probably struck every observant ocean traveller that there was a well-marked distribution of those more or less thorough-going pelagic birds that were encountered upon any protracted sea trip, and the sharpness of the definition of distribution was far more pronounced when a journey from pole to pole was made than when the voyage was more or less along one of the parallels of latitude. There was thrust upon the observer two very obvious facts, (1) that there was a very definite zoning of distribution which was normally but little transgresseed, and (2) that there was a repetition of general morphological type at latitudes roughly equidistant north and south of the equator. In a journey from south to north, the most conspicuous of the pelagic birds was the giant albatross, and, by a succession of smaller species, to the mollyhawks and larger gulls; these in their turn dropped out, and smaller gulls were encountered until the equator was passed. Having passed the equator small gulls were again encountered, then larger gulls, and finally razorbills, guillemots, puffins, and auks. The first question that naturally arose was:—Why do the albatrosses desert a ship sailing northwards from southern latitudes?

The Wonderful Albatross.

During his service on a cable ship, more than 20 years ago, he had watched these birds for days on end. They would follow the ship when she steamed about, or sat on the water around her when she was on cable ground. They would glids all day, regardless of the speed of the vessel, and, so far as he could learn, regardless of the direction of the wind. Moreover they would do this without altering their elevation or without, as far as one could see in close observation, moving any part of their wings. Their flight appeared to be merely an ability to slide ahead with no other power than their own weight and a presumably instantaneous ability automatically to readjust their planes and alter their cant and poise—largely by movements of the head. In all that there was no flap of the wings—no visible wing movement. Any one who had travelled northwards from the "roaring forties" must have noted that, though when in southern latitudes the albatross seemed to be so completely adapted, and so entirely master of its element, it appeared to lose its mastery as progress was made northward. One day on a northward journey there would be a dozen albatrosses planing astern of the ship in perfect mastery of the air; the next there would be fewer, the following morning there might be two, or a solitary individual, making rather laboured flight. At about the latitude 34 deg. S., before Fremantle was reached, the solitary bird was left flapping behind. Why did a straggler or so hold on and fly in a laboured fashion and then fall astern? In the first place it was obviously not because its food supply was lacking. Even if the bird was depending only on the ship as a source of food, it was just as prolific north as it was south of that latitude. It seemed as though it were merely the travel northwards that was prohibited—there appeared to be some factor which forbade it to enter equatorial regions.

The Northern Birds.

The same facts held true with regard to the northern representatives of the albatross, for those birds would follow a ship sailing southwards in the Pacific in the same way that the southern albatrosses followed from the south in the northward journey. But there was the difference that the northern representatives ranged nearer to the Equator. Those birds roamed along the western coast of North America, and great colonies had their nesting sites on Laysan Island. Some species even ranged as far south as the Tropic of Cancer. In the southern albatrosses the tail was almost absent; in the northern members it was of considerable length, and moreover, this bird carried its feet projecting behind the tip of its tail. He had been quite unable to detect any evidence of the presence of the "soarable air," possessing some special physical quality, which Dr. Hankin had described as existing in the wake of a ship. Ease of flight was not necessarily expressed by the great expenditure of muscular energy in the rapid flapping of wings, and to presuppose the presence of a steamer or anything else in the open wastes of the ocean as necessary to the soaring of the albatross was manifestly incorrect. He therefore regarded the soaring and gliding flight of pelagic birds, as he had observed it, as a phenomenon due rather to the morphological adaptation of the bird as an adjusted plane than to any special and chance condition of "up currents" or "soarable air" caused by impediments to the passage of air across the open ocean. Regarded in this way, the zoned north and south distribution of the different morphological types of sea birds and the failure of the albatross to follow the ship into the tropics must be investigated from the point of view of the mechanics of bird structure correlated to the environment to which it appeared to be adapted.

Planing of Albatrosses.

The great southern albatross was an extremely heavy bird, with a large body and a small plane surface. Indeed were an albatross to have the same proportion of plane surface to body weight as had a swallow, it would need wings with a span of about 40 feet and a chord of three feet. Though a bird could not increase the plane area of its wings without increasing its body weight it could add the very considerable, and adjustable, plane area of the tail, with the involvement of only a very small amount of musculature for its regulation. They knew that the tails of birds were adapted to many ends. They functioned, like the feet of the albatross, as elevators or depressors of the flying bird, and it was possible that they were used to a slight extent in lateral steering, but the primary purpose for which they were developed was the provision of an extra plane which might be adjusted in its area and which did not require a great mass of musculature for its adjustment. It had to be remembered that the analogies between a bird in soaring or gilding flight and an aeroplane could not be carried to extremes. In an aeroplane the ratio of body weight to plane area was fixed—it could not increase its plane area when it encountered a less dense atmosphere, caused either by altitude or temperature, but it could increase its "lift," and so compensate for the loss of density, by increasing its speed by virtue of the added revolutions of its air screw. A bird could not do that. If adjusted as a plane to a dense standard atmosphere it must cease to act as a plane and resort to laborious flapping in a rarer atmosphere; or if it be a bird which possessed a sufficient tail it could increase its plane area by spreading its tail. A bird that habitually conducted its planing operations at great altitudes would need a larger plant area than one that was fitted to plane at sea level, and the contrast of a condor with an albatross was instructive in this respect. A condor of the same weight as an albatross had a wing area twice as large, and an additional tail plane area into the bargain. The large-bodied birds had relatively smaller wings; and the curious fact was that this tendency for wing area to decrease relatively to body weight culminated at both Poles in the production of flightless birds—the southern penguins and their extraordinary parallels the northern auks. At the present time it did not seem possible to go beyond mere speculation in this matter, but it would appear, at first sight, to be a remarkable train of events that could lead to a reduction of plane area owing to the increasing density of the supporting medium, and finally to such a degree of reduction as to render flight impossible.

Reg. 11·6·26

THE ROYAL SOCIETY.

GLACIAL FIELDS OF SOUTH AUSTRALIA.

A meeting of the Royal Society was held at the Institute Building on Thursday night. The President (Professor Osborn) occupied the chair, and there was a good attendance.

Professor W. Howchin, F.G.S., read a paper on "The geology of Victor Harbour, Inman Valley, and Yankalilla district," with special reference to the great Inman Valley glacier of Permo-carboniferous age. He said the glacial field of that age in South Australia extended from near the Murray plains on the east of Kangaroo Island and Yorke's Peninsula on the west. The Inman Valley contained the most abundant and varied glacial features, and was, therefore, regarded as the type district. It preserved to this day the original topographical features as they existed in later palaeosoic times. It was still largely choked with moranic material. The bed rock was, in the man, a hard silicious quartzite which took the glacial polish and grooving perfectly, and was present wherever the glacial floor was recently uncovered. The ice flood came from the south, and travelled northward. It cut deeply into the Hindmarsh tiers plateau, and went over steep hills in its path up to 1,000 ft. in height. There still remained nearly 1,000 ft. of moraine in the deeper part of the valley, so that the ice must have been at least 2,000 ft. in thickness. An enormous number of large erratics were scattered over the valley, some of which weighed up to 20 tons or more. The glacial phenomena were related to other fields of the same age in each of the Australian States, India, South Africa, South America, Falkland Islands, and, probably, the eastern States of North America.

ADV. 11·6·26

THE ROYAL SOCIETY

GLACIAL FIELDS OF SOUTH AUSTRALIA.

A meeting of the Royal Society was held at the Institute Building on Thursday night. The president (Professor Osborn) occupied the chair, and there was a good attendance.

Professor W. Howchin, F.G.S., read a paper on "The geology of Victor Harbour, Inman Valley, and Yankalilla District," with special reference to the great Inman Valley glacier of Permo-carboniferous age. He said the glacial field of that age in South Australia extended from near the Murray plains on the east to Kangaroo Island and Yorke Peninsula on the west. The Inman Valley contained the most abundant and varied glacial features, and was, therefore, regarded as the type district. It preserved to this day the original topographical features as they existed in later palaeosoic times. It was still largely choked with morainic material. The bed rock was, in the main, a hard silicious quartzite which took the glacial polish and grooving perfectly, and was present wherever the glacial floor was recently uncovered. The ice flood came from the south and travelled northward. It cut deeply into the Hindmarsh tiers plateau and went over steep hills in its path up to one thousand feet in height. There still remained nearly a thousand feet of moraine in the deeper part of the valley, so that the ice must have been at least two thousand feet in thickness. An enormous number of large erratics were scattered over the valley, some of which weighed up to 20 tons or more. The glacial phenomena were related to other fields of the same age in each of the Australian States, India, South Africa, South America, Falkland Islands, and, probably, the eastern States of North America.

The Flight of Sea Birds.

Professor Wood-Jones, who read a paper on the flight of birds at sea, said it had probably struck every observant ocean traveller that there was a well-marked distribution of those more or less thorough-going pelagic birds that were encountered upon any protracted sea trip, and the sharpness of the definition of distribution was far more pronounced when a journey from pole to pole was made than when the voyage was more or less along one of the parallels of latitude. There was thrust upon the observer two very obvious facts. (1) that there was a very definite zoning of distribution which was normally but little transgressed, and (2) that there was a repetition of general morphological type at latitudes roughly equidistant north and south of the equator. In a journey from south to north, the most conspicuous of the pelagic birds was the giant albatross, and, by a succession of smaller species, to the mollyhawks and larger gulls; these in their turn dropped out, and smaller gulls were encountered until the equator was passed. Having passed the equator small gulls were again encountered, then larger