

mals would be burned to a crisp when the two suns were near each other, or frozen solid when far apart. The nebulae are enormous masses of gas seen in all parts of space. It is supposed that suns are condensed from them during vast periods of condensation. Many thousands are known. Meteors are primitive masses, each as "ancient as the sun." Suns and planets constantly receive them from space; in fact, it is thought that primeval gas first condensed into meteors, and that they then, flowing into many billions of centers, bulged suns, planets, and moons. Comets are merely large meteors, or collections of millions of much smaller bodies, as bolides, uranoliths, chunks of meteoric iron, small granular particles no larger than grains of sand, and other debris, all assembled and in flight around suns. And such is the modern concept, in dim outline, of modern astronomy. One hundred million worlds like the earth could come to an end at once and make less difference in the cosmical structure than a pebble dropped into a river. The inscrutable mystery is, how beings so minute as men can possibly find out these simply wonderful facts.

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THE VOYAGE OF THE "DISCOVERY."*

Among the recent contributions to the literature of Polar exploration and research, is the account of the English "Discovery" expedition to the Antarctic. In two large volumes Capt. Robert F. Scott, commanding this, the National Antarctic Expedition, tells of the work accomplished during the two years' sojourn within the Antarctic circle. The narrative is written with simplicity, directness, and a certain charm of style. While parts of the account go into scientific detail for the benefit of future polar voyagers, the book will be found interesting even by readers not directly concerned in Antarctic exploration.

The institution of the "Discovery" expedition was due almost entirely to the efforts of Sir Clements Markham and the Royal Geographical Society. After the usual difficulties in securing necessary funds and governmental co-operation, the sum of £47,000 was finally raised by private subscription, and this with the £45,000 contributed by the government, placed the enterprise on a sound financial basis. It was decided to build an entirely new vessel for the purpose, and in March, 1900, at Dundee, was laid the keel of the "Discovery." The ship was built in accordance with the most advanced ideas of naval architects and explorers. In June of the same year, R. F. Scott, then First Lieutenant of H.M.S. "Majestic," was appointed to command the expedition. The year following was busily occupied in completing arrangements, procuring all necessary apparatus and supplies, and selecting the other members of the party, which consisted almost exclusively of naval men.

The "Discovery" left London July 1, 1901, and arrived at Lyttleton, New Zealand, on November 29. The final leave-taking from civilization occurred on December 24, when the ship sailed from Port Chalmers, where a last supply of coal had been taken aboard. After breaking through the pack-ice, Victoria Land was first sighted on January 8, 1902. A southerly direction along the coast was continued, with landings at Cape More, Lady Newnes Bay, Granite Harbor, and other points, for survey and investigation, until further progress was made impossible by the ice pack in McMurdo Sound under the volcanic Mounts Erebus and Terror. The ship was now turned eastward in an attempt to solve the problem of the great Ross Ice Barrier. This was followed along its entire length to where it joins with King Edward VII. Land, the coast of part of which was explored. The Barrier was thoroughly investigated, at one point even by means of a balloon ascension. By February 8 the "Discovery" was again in McMurdo Sound, which was then found free of pack-ice. Winter quarters for the ship were chosen on the southwest coast of Ross Island.

The first winter in the Antarctic was occupied with meteorological, magnetic, and other observations and investigations, in becoming accustomed to the unusual conditions of livelihood necessitated by the region, and in making short expeditions into the surrounding territory. As soon as the approach of warmer weather permitted, sledge journeys for wider exploration were started. The first of these was Armitage's journey from Mount Erebus westward into the continent for about a hundred miles from the coast, ascending glaciers and mountains, to a smooth, open, snow-covered plain, over which he traveled till failing provisions forced a return. Another party, under Scott and Royds, made reconnaissances to the south. Another party under Royds left communications at Cape Crozier, for the guidance of a relief ship. On November 2, Capt. Scott started on his sledge journey along the Antarctic continent for 350 miles south of the winter quarters at Ross Island. Inexperience, loss of the entire dog-team, incipient scurvy, and late bettering of weather conditions, made this achievement note-

worthy. The farthest south was 82 deg. 16 min. 33 sec., a point 250 miles nearer the pole than had theretofore been attained. Meanwhile the relief ship "Morning" had arrived. This southern journey of Scott's ended on February 3, 1903, after 960 statute miles had been traveled in 93 days.

As the ice did not break up, the "Discovery" was obliged to spend another winter at Ross Island. The second season passed in almost the same manner as the first, and with the beginning of warmer weather, preparations for further sledge journeys were energetically pushed forward. Several short but severe trips were undertaken, either for the purpose of local exploration or to arrange depots for the later journeys. The first of these, starting on October 6, was that under Barne, to the southward toward Barne Inlet. Capt. Scott himself left on October 11, for a western journey through the Ferrar Glacier, into the great waste of Victoria Land. After a journey replete with adventure and terrible traveling, the return was accomplished late on Christmas Eve. The sledge party traveled inland for 270 miles, and found that the vast continental plateau rises to a height of over 9,000 feet above the sea, a great, monotonous, undulating plain covered by the perpetual ice-cap. In an absence of 59 days, over 725 miles had been covered. Barne's party encountered great difficulty with bad going and severe weather, and was forced to return after having barely reached the mouth of the inlet which they hoped to explore. They discovered, however, important proof of the moving of the great Ice Barrier, when it was noted that one of the supply depots established thereon had moved considerably from its original location. This party returned to the vessel on December 13, after being out 68 days. The southeasterly expedition to the interior of the Great Barrier, under Royds, returned on December 10. The party marched day after day over the same monotonous and unutterably wearisome plain of ice and snow. Extremely valuable magnetic observations were made, as here these were absolutely free from possible disturbance, either from casual iron or from land-masses.

In January, 1904, 20 miles of solid ice separated the "Discovery" from open water, and an attempt to saw a channel was seen to be impossible. On January 5 the relief ships "Morning" and "Terra Nova" appeared. As the ice gave little hope of breaking up, preparations were made to abandon the ship, and to transfer the valuable contents to the relief vessels. By February 16, however, the "Discovery" was freed with the help of explosives, the miles of intervening ice having previously been broken up by stress of weather. From McMurdo Sound the little fleet ran north along the coast, the "Morning" soon leaving for New Zealand, while the other two continued to the north. Shortly after the "Terra Nova" and the "Discovery" separated and the latter turned to the westward between latitudes 67 and 68. The Balleny Islands were found to be identical with the three Russell Islands of Ross. It was also found that the extreme eastern part of the coast line indicated by Wilkes does not exist, and this disproves the hypothesis that the coast of Wilkes Land is extended eastward in a long connected line to Victoria Land. Thus it is probable that there is an important recession of the shore to the west of Victoria Land, which may be a broad peninsula. On March 15 Ross Harbor, Auckland Island, was reached, where the other two vessels soon joined the "Discovery." On April 1 Port Lyttleton was entered, and the final return to civilization accomplished. September 10 saw the "Discovery" again at Spithead, England, after an absence of three years and one month.

The two years of strenuous work were crowned with success. The eastern edge of the Antarctic continent was traced for 350 miles south of the winter quarters, thus completing a fair survey of about 1,000 miles, including coastal irregularities, of this shore line extending mainly north and south. The explorations of the surface of the Great Barrier and the inland continental plateau were extensive, notwithstanding initial and complete ignorance of sledging and sledging methods. The complete survey of the edge of the Ice Barrier to where it joins the newly discovered King Edward VII. Land, proved that the Barrier has receded considerably since the time of Ross. It is not considered a land ice-cap, but is believed to be an ice-mass afloat on a great sea basin. The extreme southern dash was made on the surface of this Ross Barrier, a huge plain so flat that even slight objects could be seen for miles. It is bordered, on one side at least, by high mountains, some of which reach elevations of 12,000 to 15,000 feet, and these continued as far as could be seen from the farthest point south. The opinion has been advanced that possibly these mountains extend over the pole as a continuation of the mountains of Graham Land and the Andean chain. The geographical, meteorological, zoological, and magnetic and other physical investigations are of great value, and go far to show that the voyage of the "Discovery," as Capt. Scott says, "was not undertaken in a spirit of pure adventure, and that the members of the expedition strove to add, and succeeded in adding, to the sum of human knowledge."

SCIENCE NOTES.

Hardly any theory is all true, and many theories are not all false. A theory may be essentially at fault and yet point the way to truth, and so justify its temporary existence. We should not, therefore, totally reject one or other of two rival theories on the ground that they seem, with our present knowledge, mutually inconsistent, for it is likely that both may contain important elements of truth.

A new industry, the making of mattresses, pillows, etc., of sponge, has been started in Florida. The sponge material is cleansed of all foreign matter by a scrubbing process in large tanks of water, then run through wringers, and the drying continued by subjecting it to a cold-air blast. It is then shredded by machinery, sterilized, and rendered odorless by chemical treatment, and subjected again to cold-air drying, when it is ready for use. It is claimed that the sponge mattresses are only about one-third of the weight, and cost only about two-thirds as much as those of the same size made of hair, that they are thoroughly springy, yet firm and durable, and that they are especially sanitary, the material being non-absorbent of moisture and emanations from the body. A pillow is made measuring 19 by 26 inches which weighs only one pound, feather pillows of the same size weighing three pounds. Other articles are a sponge cushion and a toy sponge ball as light as an inflated rubber ball.

The berries of different species of coffee generally contain from 10 to 15 grammes of caffein per kilogramme. M. Bertrand, in a recent communication to the Académie des Sciences, shows that there are exceptions to the rule. The coffee of the Great Comoro, to which Baillon has given the name of *Coffea Humboldtiana*, does not contain the slightest trace of the alkaloid. This exception is the more curious, as this species much resembles the ordinary kind, the *Coffea arabica*. The absence of caffein in the coffee of the Great Comoro is not due to the influence, either of the soil or of the climate of the African island. Analysis of the *Coffea arabica*, cultivated in the same island, has yielded a normal percentage of caffein, 13.4 grammes per kilogramme of the berries. Other coffees gathered near Diego-Suarez in Madagascar, and quite distinct species, exhibit the same peculiarity, the absence of caffein. This fact is not accidental, but a distinct characteristic of certain species, previously found only in Madagascar.

Prof. Moreaux describes in a paper, read at a session of the Académie des Sciences, observations on a waterspout which passed through the communes of Saint-Maur and Champigny on the 28th of August. The direction was from west-southwest to east-northeast. It seems to have been formed to the south of Saint-Maur-ice, and passed over a space of about five kilometers in twenty-five minutes, from 10 minutes after 3 o'clock to 35 minutes after 3 o'clock in the afternoon. It was noticed at the observatory of Saint-Maur when it had completed about half of its course. Its passage was accompanied with a sound which is described as resembling that of a battery of artillery drawn on the gallop over a paved street. At the base of an extended nimbus hung the reversed cone characteristic of phenomena of this kind. The barometer, 11 millimeters lower than the day before, stood at 745 millimeters at an altitude of 50.3 meters, at 5 minutes after 3 o'clock, when the fall was increased. A strong wind was then blowing from the south-southwest. The temperature was 15 deg. C. These two conditions did not change. The waterspout passed to the north of the observatory within a distance of about one kilometer. It was preceded by a storm, and followed by a shower.

The ordinary methods for the determination of refraction, of which the influence is so considerable in all astronomical measurements, are attended with great difficulties. Observations must be accumulated during a course of years, and at the same time estimates must be made of the multiple effects of the numerous causes that may intervene in measurements taken by means of meridian and other similar instruments. M. Loewy, who has studied this subject closely, pointed out several years ago two methods by which the inconveniences might in great part be avoided. They were based on the comparison of the stellar distances by the use of a special compass, of which the opening remains constant; this consists of two mirrors cut from the same block of glass in prismatic form. With the aid of this optical apparatus before the objective of an equatorial, the distance between two stars may be determined, whatever the size, with much precision. The constant of refraction may be deduced under certain conditions. In a new communication to the Académie des Sciences, he has recently made known an improved method free from the practical imperfections of the previous theoretical solutions. By means of a single prism the refractions can be exactly measured at all zenithal distances, by taking advantage of the fact that the apparent distance between two stars is not diminished by the effect of refraction, provided the vertical circle of one of the stars is perpendicular to the arc of the great circle which joins them.

* The Voyage of the "Discovery." By Capt. Robert F. Scott, C. V. O., R. N. In two volumes. London, 1905, Smith, Elder & Co. New York: Charles Scribner's Sons.