OUR ASTRONOMICAL COLUMN.

BRILLIANT WHITE SPOTS ON MARS.—In No. 10, vol. xix., of *Popular Astronomy* Mr. L. J. Wilson, who observes Mars with an 11-inch reflector, cites several occasions during October and November, 1911, when his observations at Nashville, Tenn., revealed the presence of very conspicuous and brilliant white spots on the planet's disc; such spots were seen, on October 14, in the region following Hesperia. Comparing his recent observations with those made during 1909, Mr. Wilson concludes that the frequent formation of such spots is an unusual feature of the present apparition.

COMETARY PHENOMENA.—A discussion of cometary phenomena is published by Prof. Karl Bohlin in an abstract from the *Naturwissenschaftlichen Rundschau*. Prof. Bohlin deals with such matters as the orbits, the brightness and structure of the different parts of comets, the facts revealed by spectroscopic analysis, and the peculiar fluctuations of the form and brightness of the tails of various comets. Of general interest will be found the tables he gives showing the variation of all these features in a large number of well-known comets which have appeared since the seventeenth century.

THE ANTARCTIC CAMPAIGN.

AT the present time it is not unlikely that the south pole has been reached by both Captain Scott and Captain Amundsen, who are leading respectively British and Norwegian Antarctic expeditions. The accomplishment of this athletic feat is one that the public take an intense interest in, and not least of all at the present time because there are two competitors in the polar race, which adds zest from the sportsman's point of view. Any journey in Antarctic regions must also add something to our knowledge of the Antarctic regions, and any additional knowledge is of scientific value. But the two expeditions are of much greater interest to the scientific community from the point of view of the work they will do outside this journey to the pole, for, so far as the polar journey is concerned, Captain Scott intends to follow over his own track and Sir Ernest Shackleton's, except for the last hundred miles, and Captain Amundsen may, after tracking in a south-westerly direction across the surface of the Ross Barrier, also follow Sir Ernest Shackleton's track up the Beardmore Glacier, and thence to the pole, practically in the same line as Captain Scott. The only additional topographical information therefore gained by these journeys is in the possible track of Amundsen from the vicinity of Edward Land to the Beardmore Glacier, and the same track that both Scott and Amundsen are likely to take over the last hundred miles to the pole, which, we fairly well know from Shackleton's observations, must be situated at an altitude of something like 10,000 ft. on the inland ice of Antarctica. We hope that Scott and Amundsen will meet each other, and, mutually helping one another, reach the pole with honours divided.

Mr. Mossman reports that great reticence was shown by the members of the Norwegian expedition while in Buenos Aires with regard to Amundsen's southern journey, but that he was to leave for the south not later than September, and that he hoped to reach the plateau by another way than the Beardmore Glacier, and emerge somewhere in the neighbourhood of Alexander Land, a region already visited by Amundsen on board the *Belgica*. The accomplishment of a journey along this route would be not only a triumph of physical endurance, and good organisation of food supply and equipment, but would also add immensely to our knowledge of Antarctica.

If the pole is attained by either or both of these explorers, the thanks of the scientific world are due to them for having once and for all settled the matter, and thus helping the public to understand that serious south polar exploration is not to reach a certain mathematical point before somebody else, but rather to carry on systematic investigations within the greatest unknown area on the surface of our globe, an area that occupies about five and a half million square miles—*i.e.* almost as great as the area of Europe and Australia combined.

It was Scott's intention to land a party not only at McMurdo Sound, but also on Edward Land. After Scott and his party were landed at McMurdo Sound, Lieutenant Pennell received command of the ship, and took Lieutenant Campbell's party with him, consisting of six, all told. The party was, however, unable to land at Edward Land, "owing to the perpendicular ice cliffs." This being so, an attempt was made to land them "as far west of Robertson Bay as possible," and make discoveries in that direction, but "from Smith Inlet to Robertson Bay there was not a single spot where a party could land—all sheer ice cliffs." Campbell and his party therefore landed at Cape Adare. After landing the party Pennell cruised to the west of Cape North, and discovered new land westward in two places. In the meantime, Scott and his party had finished setting up their camp, and Scott had begun a journey to the south that was probably preliminary to his great effort to reach the pole. Beyond this we have very little information, but since the return of the *Terra Nova* to New Zealand we understand that the ship was chartered by the New Zealand Government in order to carry out some hydrographic operations in the vicinity of New Zealand during the winter months. These hydrographic observations, made under the auspices of the New Zealand Government, are sure to be of the greatest possible scientific value; and now the *Terra Nova* has sailed once more for the south, and no word will be heard of her for another month or so. It is understood, however, that Lieutenant Pennell takes news to Captain Scott that sufficient funds have been acquired to enable him to stay out for another season, so that if reaching the pole is disposed of, the expedition should have a most excellent opportunity of carrying out explorations and various observations which will be of the highest possible scientific value.

Amundsen's party has, according to information received, succeeded in landing on the Ross Barrier in longitude 162° W., about fifty miles west of Edward Land, at a place he has named Bay of Whales. The news of the discovery of the Norwegian expedition at this point by Lieutenant Pennell came as a great surprise to all in Britain, but from the scientific point of view it cannot but add to the value of Scott's observations as well as Amundsen's, and, as I have said, from the sportive point of view it adds zest. Moreover, every mile Amundsen and his party travel over to the east of Beardmore Glacier will be new, and any observations taken at the Norwegian base station will be entirely new and of great value.

The *Fram*, which has carried two successful expeditions to the Arctic regions, made a long voyage out to the Ross Barrier from Madeira without calling at any intermediate port, and again from the Ross Barrier she made a second extensive voyage without calling at any port until she reached Buenos Aires. During the past southern winter she has crossed the Atlantic twice from Buenos Aires to Africa, and has taken observations at sixty stations. In order to

get a clear idea of the past work and future programme, I quote from information that Mr. Roald Amundsen has been good enough to send me which has been furnished to him by Captain Nilsen, the commander of the *Fram*:—

"We left Buenos Aires," says Captain Nilsen, "on June 8, 1911, exactly one year after our departure from Hörten (Norway), on our first oceanographic voyage to the northern part of the South Atlantic. The pilot accompanied us to Montevideo, where we stopped until Sunday morning, June 11, on account of a 'pamperos' (south-westerly wind very violent), when we continued our way in the Atlantic Ocean in good order. The weather hindered us from beginning the sounding before June 17, but from that day everything went on all right. We commenced first with sounding, taking also water samples and temperatures down to 2000 metres; but this took us eight hours, and as during this time we had to stop with fixed sails, one-third of the twenty-four hours passed. Time being short, as we would have to leave Buenos Aires about October 1, we could only get on a short distance in the Atlantic if we had to continue this work, and it was necessary, therefore, to abandon sounding altogether, and we took observations down to 1000 metres only. We sailed from the La Plata River in a line approximately straight towards 9° E. longitude and about 21° S. latitude; we arrived here on July 22, and sailed towards St. Helena, which we passed on the evening of July 29. We continued to South Trinidad, which we passed very close to on August 12. On August 25 we finished the oceanographic observations in about 25° S. latitude and 40° W. longitude. All in all, we have had sixty stations, and have collected 891 water samples, which will probably be sent home by the *Kronprinzessin Viktoria*. We have also about 200 bottles of plankton.

"We returned to Buenos Aires at midnight on September 1. During the whole time the weather has been fair, and our course was fixed according to the winds; we sailed eastward to Africa by almost steady northerly and north-westerly winds that lasted exactly four weeks, and during this time the motor was at a complete standstill. In order to cover as even distances as possible, we sailed at a rate of 4 to 5 knots. As we had to take in the sails at each station, they got so worn that they scarcely kept together at last; and I had no mind to use our second set of sails, that ought to be in tip-top order when we got into the 'roaring forties.'

"The voyage has in every respect been a good one for the *Fram*; her motor has been thoroughly examined and cleaned during the long rest, the rigging looked after, all iron has been cleaned for rust, and the vessel has been painted all over; the *Fram* looks finer now than she did when she was new. The stores have been arranged, registered, and cleaned, and the sailmaker, Rönne, has been sewing sails, &c., from 6 a.m. to 6 p.m., and several alterations and modifications have been made by the chief engineer, Lundbeck, who is a man and an engineer of the first order."

This is the chief information received from Captain Amundsen.

It seems almost a pity that a vessel so well fitted for oceanographical research as the *Fram* is, in higher latitudes, worked north instead of south of 40° S., for with the exception of the *Scotia's* hydrographical observations south of 40° S., little has been done in oceanographical research in high southern latitudes in the Atlantic Ocean, whereas north of that latitude the *Challenger* and subsequent expeditions have done much to add to our knowledge of those seas.

Some important observations have, however, been made south of 40° S. by the *Deutschland*.

The *Fram* is not expected to carry out any oceanographical research in her circumpolar voyage—she will only just have enough time to fetch the landing party, and again regret must be expressed that time has not been allowed to carry out such researches in those high southern latitudes by an ice-protected ship. Nothing is yet decided as to 1912, but Mr. Roald Amundsen does not think it likely that the *Fram* will proceed across the North Polar Basin before 1913, as that depends on the funds available.

Four other expeditions are also carrying on researches in the south polar regions, namely, an Australian one under Dr. Douglas Mawson, a German one under Lieutenant Dr. Filchner, a Japanese one under Lieutenant Shirasé, and last, but not least, the Argentine expedition, which sailed for the South Orkneys to continue the meteorological and magnetical work initiated by the Scottish expedition at Scotia Bay in 1903, and continued by the Oficina Meteorologica Argentina since 1904 at an annual cost of about 6000*l*. With regard to the Japanese expedition, practically no news has reached Europe, and, indeed, notice that the expedition left Sydney on November 19, 1911, came as rather a surprise, as it was thought that after being so hopelessly late in the previous season they would not for the present attempt further work. Whatever are the aims of the present Japanese expedition, the writer has reason to believe that we may expect Japan to take a very prominent part in Antarctic exploration of a purely scientific kind before many years are past. The work of the German expedition lies in the Weddell Sea in longitudes west of Coat's Land, Dr. Filchner having generally agreed with the writer that the region to the east of this should be left for the proposed Scottish expedition. If, however, the Germans fail on account of conditions of ice or other difficulties to carry on their work to the west of this longitude, it is quite understood that they are to be free to work to the eastward. So far as the writer is concerned, he is of opinion that it is not in the interests of science that an expedition actually in the field should be hampered in any way by reserving an area for another expedition which has not so far succeeded in raising all the necessary funds. The area of the unknown Antarctic regions is so vast that there is plenty of room for all-comers, and more especially so if there is a division of labour in the work.

There are two prominent theories of the structure of Antarctic lands. Filchner bases the plan of his expedition upon the theory held by himself, Dr. Penck, Dr. Otto Nordenskjöld, Sir George Darwin, and others, that there are two Antarctic land masses which are divided from each other by a channel possibly covered by a continuation of the Ross Barrier running across from the Ross Sea to the Weddell Sea, thus dividing Graham Land from the rest of the land. The other prominent theory, which has for long been held by Sir John Murray, and is supported by Sir Ernest Shackleton, Dr. Mawson, and myself, is that there is one great Antarctic continental land mass with no such division across it. A third theory, held by Dr. Nansen, is that the Antarctic land is composed of an archipelago of islands. In a paper [1] delivered to Der Schweizerischen Naturforschenden Gesellschaft at Basel in 1910, I summarised my reasons for holding the view that there was one great Antarctic continent.

Having a definite theory of the structure of the Antarctic continent, Filchner sets out to test the accuracy of it. His confidence augurs well for the success of the German expedition. "Morgen früh 10 Uhr (also am 10 December) gehen wir," says he, "in See nach dem Eis mit rein südlichem Kurs bis zum Auftreffen auf die Eisbarre und folgen ihrem nördlichen Rande, dann so lange östlich, bis wir sie durchqueren können." This confident assurance reaches us from South Georgia, from which place

[1] "Über die Fortsetzung des antarctischen Festlands zwischen Enderbyland, Coatsland und Grahamland, sowie das Vorhandensein im Morrellsland." Von Herrn Dr. William S. Bruce, Direktor der Scottish Oceanographical Laboratory.

I have had word from Lieutenant Dr. Filchner and Dr. Heim, geologist to the expedition. They inform me that they have so far had a successful voyage, having landed at St. Paul's Rocks, and having already taken as many as eighty soundings. Several of them appear to have been taken in the neighbourhood of South Georgia and the South Sandwich Group, and these will form a most important contribution to the study of former Antarctic continental connections with South America. "Storm and stress of weather hindered every attempt at landing on the South Sandwich Group," and in this connection it is interesting to note that this heavy weather was previously predicted by Mr. R. C. Mossman at Buenos Aires.

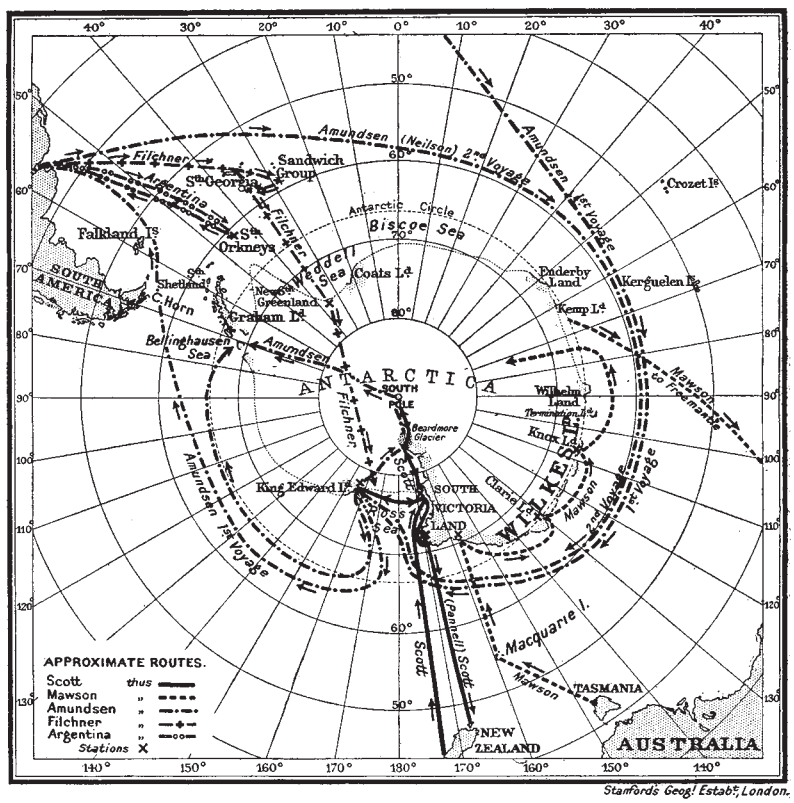
Prof. Penck, who has been good enough to furnish me with much useful information, says:—"Reaching the pole does not form a special feature of the programme." He also writes saying that Filchner will establish a station to the west of Coat's Land, and will not leave the Antarctic regions until the summer of 1913–14.

A most important line of sixteen soundings[3] has been taken from Monte Video to South Georgia and the South Sandwich Group which confirms the existence of deep water of 2500 fathoms which the writer supposed existed there[4] between 35° S., 52° S., and 21° and 55° W. Filchner extends this 3000-fathoms water to a point west of South Georgia, where he obtained a sounding of 3064 fathoms. This sounding, along with one of 2358 fathoms and a second of 2413 fathoms Filchner considers to the west of South Georgia, precludes the possibility of a "rise" (unterseeische Verbindung) between South Georgia and the South Sandwich Group, but another sounding of 1787 fathoms between Lieskow Island and South Georgia seems to confirm, to my mind, the existence of such a rise. Close to Candlemas Island 478 fathoms was obtained, and depths of 1144 and 1757 fathoms were obtained close to the group, just as the *Scotia* sounded in 1745 fathoms 15 miles off the South Orkneys.

Although the deeper water from the north dips rather further south than it was previously supposed to do, the suggestion that there is no "rise" is worth consideration as leading to the possibility of the Sandwich Group being cut off from the South American-Graham Land connection, and indicates the great importance of more soundings to the south of South Georgia. Quite extensive and interesting geological excursions were made in South Georgia, which were facilitated by Captain Larsen lending the German expedition his 500-ton yacht *Undine*. The Germans have found that South Georgia is a folded mountain range, probably part of the Faltengebirge of the South American Andes and Graham Land. The tuffs found by Gunnar Andersen in 1902 are found to be old Mesozoic and young Palæozoic tuffs. Dr. König found an ammonite in the slate of Possessions Bay. Bad weather prevented pendulum observations, but earth magnetic elements were determined.

It took from November 1 to 14 to go from South Georgia to the South Sandwich Group. A course was first steered to Lieskow Island; the *Deutschland* then passed Candlemas Island, and left the group at Zavadowskij Island. Some of these islands are extinct, and others active, volcanoes. The rocks appeared to be basaltic. Volcanic sand containing basaltic fragments was secured by sounding.

Meteorological and other observations were made, and it is especially interesting to note that for the first time in Antarctic regions *ballons-sondes*, as used by the Prince of Monaco in Spitsbergen, were employed, since in South Georgia sixty-five of these balloons were released. These were traced to a height of 9 kilometres, or 29,528 ft., and should give valuable information regarding the higher atmosphere in the south polar regions.



[3] *Zeitschrift der Gesell. f. Erdkunde zu Berlin*, 1912, No. 2.

[4] "Bathymetrical Survey of South Atlantic Ocean and Weddell Sea." By Wm. S. Bruce. With Map and Illustrations. *Scot. Geog. Mag.*, August, 1905.

existence or non-existence of New South Greenland, discovered by Captain Johnson in 1821–22, and revisited and described by Morrell in 1822–23—the summer Weddell attained the high latitude of 74° 15′ S. in those longitudes. If Filchner falls in with New South Greenland it will almost preclude the possibility of the existence of the suggested ice-covered strait cutting across Antarctica from the Ross to the Weddell Sea.

Altogether, the German expedition has most interesting and fascinating problems to solve, and with such a good ship—the *Deutschland*—with such excellent equipment and staff, and so competent a leader, should not fail to bring us back much valuable information.

The Australian expedition, under the able leadership of Dr. Douglas Mawson, is on quite a different plan from any of the others in the field, and in that it will do not only a considerable amount of hydrographical work, but will also make deep-sea biological research a special feature, it resembles more the general plan of the late Scottish expedition. In fact, the *Aurora's* trawling gear is much the same as that used by the *Scotia*, and she carries with her the *Scotia's* quick-working winch, which was used for hauling up the sounding apparatus, the deep-sea water-bottles and thermometers, and vertical plankton net. Mawson also emphasises meteorology, especially in relationship to Australia.

The *Aurora*, which was refitted in London under the guidance of Captain Davis—who is her master, and was previously master of the *Nimrod*—left Hobart on December 2, and pushed south-eastward, calling at the Macquarie Islands on December 21, after which Mawson intended to land a party west of Cape North, directly north of the magnetic pole. This party will hope to complete the magnetic data yet wanting in the vicinity of the south magnetic pole. Proceeding eastward, a second party will be landed at Clarie Land, and a third at Knox Land. These parties, by man, dog, and motor sledges, will seek to map out the coastline to the east and west of their respective stations. The voyage is then to be prolonged westward about the latitude of the Antarctic circle as far as Enderby Land, whence the *Aurora* will return to Fremantle.

The programme is a very ambitious one, and Mawson may rest well satisfied if he lands but one party and carries out a general investigation of this little-known and much disputed coast, including oceanographical and meteorological survey. In 70° E., viz., the longitude of Kerguelen Island, an attempt will be made to penetrate southward as well as in the longitude of the magnetic pole. Mawson regards this part of the Antarctic continent to which his efforts are to be directed as by far the most important portion of Antarctica yet to be explored. He points out that "along the whole 2000 miles of coast between Cape Adare and Gaussberg a landing has been made once only, and then but for a few hours, by d'Urville's expedition in 1840. Only a few vessels have ever come within sight of this coast, and practically none since the days of d'Urville and Wilkes."

Mr. Alfred Reid tells me that lack of coal may render it necessary for the *Aurora* to put into Kerguelen for ballast on her return to Fremantle under canvas. In April the *Aurora* will again go south with a number of Australian men of science in order to carry out dredging and sounding in seas between Australia and Antarctica, and in December the *Aurora* will proceed south once more to pick up Dr. Mawson and his colleagues at the three stations.

Mawson carries with him an aëroplane and certificated air pilot, and has, like Filchner, an installation of wireless telegraphy. The expedition, which carries a crew and staff of fifty persons, is well supported by the Australian and British Governments and by private enterprise.

Mawson is a geologist of the first order and a trained magnetic observer, and with Shackleton's expedition gained an intimate insight into the geology of Antarctica and its relationship to Australasian geology. He is an enthusiast, and his plans are original and well thought out. Mawson is well supported by Captain Davis and an excellent scientific staff, and thus the Australian expedition is sure of a scientific success, and more especially so since the expedition is not hampered by taking part in the race to the pole.

As I have already stated, little is known of the plans and prospects of the Japanese expedition, but it is to be hoped that they will be rewarded with a rich harvest of scientific results that will encourage future efforts on the part of Japan.

Finally, success is assured for the enterprising Republic of Argentina, with meteorological and magnetical work at the first-class station at Scotia Bay, which now commences work for the tenth consecutive year—a triumph without equal in the annals of polar exploration. Every year the Argentines send out a party of trained meteorologists and magneticians, who winter at Scotia Bay, frozen in and cut off completely from the rest of the world for twelve months, and it is interesting to note that the leaders of this work, under the able directorship of Mr. Walter J. Davis, of the Oficina Meteorologica Argentina, have been trained at Ben Nevis Observatory, which the British Government persistently refuses to support for no other reason apparently than that it happens to lie north of the Tweed.

WILLIAM S. BRUCE.

FISHERIES OF BENGAL.

THE Journal of the Royal Society of Arts of December 22, 1911, contains a full report of a paper on the fisheries of Bengal, by Dr. J. T. Jenkins, read before the society on November 14. In response to an invitation from the Indian Government, the author proceeded to India in October, 1908, for the purpose of undertaking, during a period of eighteen months, a practical investigation into the possibilities of the fisheries of the Bay of Bengal and the Sandarbans. He was provided with a trawling steamer, the *Golden Crown*, which was unfortunately not so efficient as she might have been; and with this vessel trawling was carried on for a considerable period in various parts of the bay, work being carried on night and day. As a rule, four hauls were made *per diem*, and it was found, despite the monsoon, that trawling can be carried on at all seasons of the year. The results fully confirmed the anticipations which had previously been made by Lieut.-Col. Alcock and others as to the richness of the fishery, large supplies of the food-fishes most esteemed in the Calcutta market, as well as others, being obtained.

Even the coarser kinds would find a ready sale among the poorer classes of Bengalis, while in the case of uneatable species like sharks and swordfishes the liver and fins could be utilised.

As to the practicability of bringing the catches in good condition to market, it was found that, if stored in ice, the fish would keep perfectly well for a certain time. In the event of the fishery being worked commercially, it is recommended that Diamond Harbour, which is much lower down the Hughli than Calcutta, with which it is connected by railway, should be selected as a base for trawling.