Photography in Natural Colours.

IN NATURE of October 4 (p. 571) you referred to the fact that the new method of photography in natural colours described by Prof. Lippmann in the *Comptes rendus* of July 30 had been forestalled by myself and published in the *British Journal of Photography*, January 1, 1904. It is now my turn to disclaim priority, for Mr. F. Cheshire, who wrote you on the subject before, has just found, and kindly brought to my notice, a patent taken out by Mr. F. W. Lanchester, of Alvechurch, dated 1895, which describes to all intents and purposes the same arrangement. Not less curious is the fact that between the times of my own and Prof. Lippmann's publications, another French investigator, M. A. Cheron, devised the same method and obtained a French patent for the same early this year, and another French worker, M. Raymond, has, according to M. Cheron's communication to this month's number of *La Photographie des Couleurs*, been apparently working on the same lines.

We have here, therefore, the strange coincidence of five different people quite independently inventing the same method. JULIUS RHEINBERG.

16 Coolhurst Road, Crouch End, N., November 24.

ANTARCTIC EXPLORATION.[1]

THE story of the Antarctic is longer in time than in materials, for the necessary existence of lands around the South Pole was affirmed by some of the earliest geographers. There was abundant speculation about the character of these South Polar lands and the impossibility of reaching them before Bouvet found his islet and Cook was convinced of the existence of a great southern continent. The Antarctic regions have furnished less dramatic incident and fewer commercial returns than the Arctic, but they have probably given, in proportion to the efforts devoted to them, more wide-reaching scientific results. Dr. Mill's book gives a full and graphic sketch of the whole subject. It summarises the classical and mediæval speculations, tells the narratives, and explains the results of all the expeditions that have worked in the Antarctic. It handles the many branches of the subject—oceanography, terrestrial magnetism, topography, and bibliography—with expert knowledge, an intimate acquaintance with the scattered literature, and high literary skill. The story is enlivened by pithy anecdotes, and gives lucid explanations of the scientific problems, so that the book is as interesting as it is instructive. It tells us, for example, of the cost of various expeditions. Thus Cook's great results were achieved for 20,000*l.*, and the *Belgica* Expedition gained its rich harvest for only 12,000*l.* It helps us to place the explorers, by other incidents in their lives, such as Dumont d'Urville's discovery of the Venus of Milo, Maury's service in the Confederate Navy, Wilkes's achievements on behalf of the Northern States in the same war, and his famous arrest of the *Trent*. The literary history is enlivened by many items of bibliographic interest, such as the mythical author "H. M. S. Slaney," the recovery of the remarkable appeal to the Geographical Society in 1837 on behalf of Antarctic research by "A. L.," from a French translation, and the loss of Enderberg's MS. in one of the London Society's libraries.

The siege of the South Pole has been conducted by campaigns at three periods. The first period began in the time of Drake, who reached 57° S. lat., and of de Quiros, who proclaimed his annexation "in the name of the Holy Trinity of all islands and lands which I have recently discovered and will discover even to the Pole." The great achievement of this period was the voyage of Cook, whom Dr. Mill regards as the hero of Antarctic work. He describes him as "the greatest of British maritime explorers, the one man who could be compared with Columbus and Magellan." He deplores that the only reward he received after his Antarctic voyage for "his stupendous service to science and his country, was a step in naval rank"; and he reminds us of the almost incredible fact that "Cook's own log was actually left unpublished for 130 years, while, incredible as it may seem, the description of some of the scientific collections of the voyage with the plates engraved at the time are only now appearing in the twentieth century." Cook's work showed that the Antarctic continent was confined within narrower limits than had previously been thought, but Cook, though he did not actually land on Antarctica, was emphatic as to its existence. More definite knowledge of the Antarctic continent was obtained by the explorers of the second period, that of Bellingshausen, Weddell, Biscoe, Wilkes, and Ross. It is to the work of that period that we owe most of the data that enabled Sir John Murray, after the dredging of the *Challenger* had given the geological proof of the continental structure of the Antarctic lands, to prepare the outline map of Antarctica, which, as Dr. Mill tells us, "subsequent discovery has not as yet materially modified." The active research of the second period was brought to a sudden and complete stop; the siege was raised for sixty years. The abandonment of the work was perhaps partly due to the disgust at the quarrels in America over the Wilkes Expedition, and at the feud between Wilkes and Ross; but Dr. Mill attributes it mainly to the concentration of attention in the Arctic, in consequence of the Franklin tragedy. Ross's voyage naturally receives the fullest treatment, owing to its important results. Great though they were, they might easily have been greater, for Dr. Mill, who has had personal experience of scientific research in naval vessels, remarks that "the average naval officer understands something of physical observations, but the collection of geological and natural history specimens is a mystery to him, and he abhors such mysteries"; and he describes how McCormick was hampered in his attempts to make zoological collections, and the misleading influence of Ross's theories, based on his mistaking records of pressure for deep-sea temperatures. Had Ross's expedition, says the author, "been organised on the lines subsequently followed on that of the *Challenger* the gain to science would have been enormous."

The third period includes the Antarctic research of recent years. The long agitation for the renewal of the work is fully told by Dr. Mill, from the appeal by Maury to the Geographical Society in 1860, and the persistent efforts of Neumayr, who was promised the leadership of an expedition from Hamburg in 1870, which was stopped by the Franco-German War; he records the "snubbed proposals" of the Australian colonies, the suggested Australian-Swedish expedition, and the resumption of Antarctic research by the whalers, by Dallmann in 1873, the *Balaena* with W. S. Bruce in 1892, the *Jason* under Larsen, and especially the *Antarctic*, sent by Sven Foyn in 1894 to the Ross Sea. These commercial enterprises re-aroused the public interest in the Antarctic, and led to the despatch of the British, German, Belgian, Swedish, and French expeditions of the opening of this century, the results of which are now in course

[1] "The Siege of the South Pole, the Story of Antarctic Exploration." By Dr. Hugh Robert Mill. Pp. xvi+455; with maps and illustrations. (London: Alston Rivers, Ltd., 1905.)

"The Voyage of the *Scotia*. Being the Record of a Voyage of Exploration in Antarctic Seas." By Three of the Staff. Pp. xxiv+375; with three maps and numerous illustrations. (Edinburgh and London: Wm. Blackwood and Sons, 1906.) Price 21*s.* net.

of publication. Dr. Mill closes his volume with proposals for an international scheme of Antarctic research, to be undertaken with the help of an international committee, the functions of which he proposes should be advisory. He recommends the use of three or four whalers and light motor-cars, but no balloons, the uselessness of which has been twice proved. The actual organisation of the expeditions should be left to those responsible for the money, and he holds that "the price of a battleship would conquer all the secrets of the South, . . . not without risk, but still with far less risk than in say ten years of football." The book is illustrated with an excellent map of the Antarctic regions by Bartholomew, by many photographs of the scenery and ice-forms, and an excellent series of portraits of the chief actors in the Antarctic field. The frontispiece, an instructive picture of Antarctic ice, has been contributed by Prof. von Drygalski.

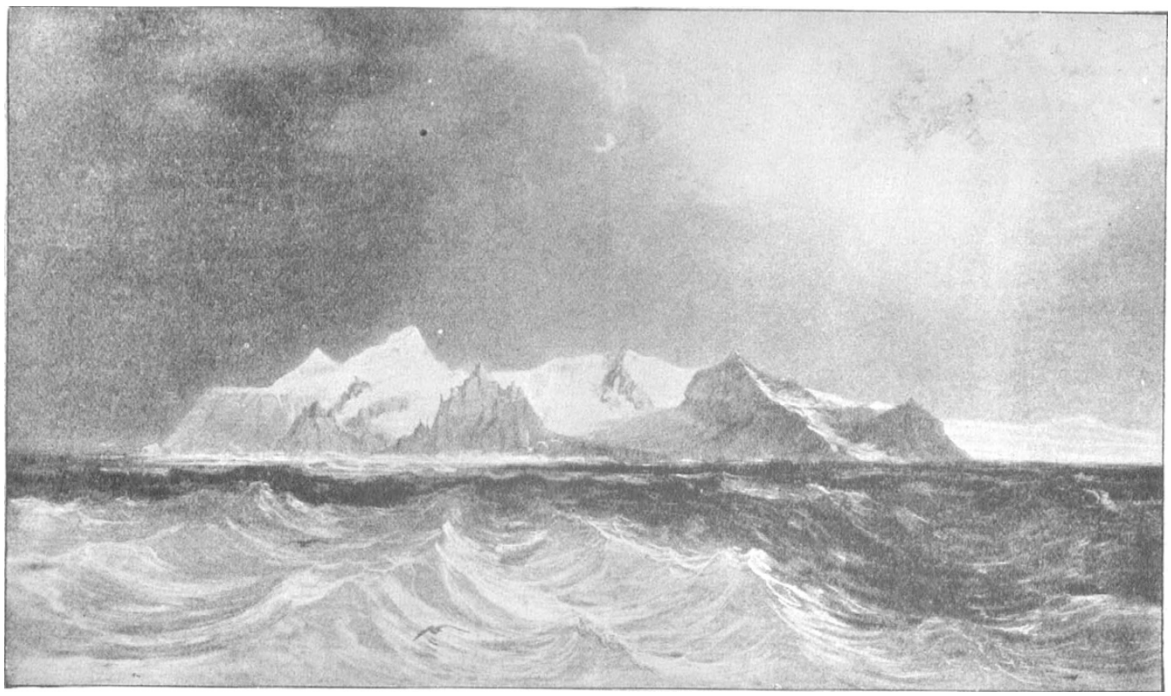

FIG. 1.—View of Elephant Island, one of the South Shetlands, in d'Urville's "Atlas." From "The Siege of the South Pole."

The latest original contribution to Antarctic literature is "The Voyage of the *Scotia*," the narrative of the Scottish National Antarctic Expedition. The expedition was organised and commanded by Mr. W. S. Bruce, who after a voyage to the Antarctic in a Dundee whaler in 1892–3 had persistently advocated the despatch of an expedition to the Weddell Sea, and by careful training had rendered himself fit for its command. He had made several visits to the Arctic, and from 1894 to 1896 had been in charge of the Ben Nevis Observatory, so that he was an expert in meteorological observation. The funds available for the expedition were comparatively small, and were mainly due to the generosity of Mr. Jas. Coats, of Paisley. The expedition left the Clyde on November 2, 1902, and the Falkland Islands on January 26, 1903. It was already late in the season, and the ice appears that summer to have been unusually thick in the Weddell Sea; but the *Scotia*, commanded by an experienced Arctic navigator, forced its way through the pack to the latitude of 70° 25′ S., and though several times beset, it escaped and returned to the South Orkneys. Suitable winter quarters were found in Scotia Bay, on Laurie Island; a house and magnetic observatory were built ashore, and the winter spent in active work. On the return of spring sledging expeditions explored the island and determined the Ordovician age of its rocks by Dr. Pirie's discovery of Pleurograptus and Discinocaris in the slates of Graptolite Island.

As soon as the *Scotia* could be freed from the ice it sailed for Buenos Aires for stores, &c., while Mr. Mossman, with five men, remained at the station to continue the meteorological work. The *Scotia* returned on February 14, bringing with it a party of observers sent by the Argentine Government, which had wisely undertaken to maintain the meteorological station; Mr. Mossman remained to help the Argentine party during its first winter, and the *Scotia* left on February 21 with the rest of the Scotch expedition for its second cruise in the Weddell Sea.

Here the expedition achieved its two great geographical successes. It discovered a new land, Coats Land, which, judging from the boulders dredged off it, is composed of continental rocks, granite, gneiss, schist, sandstone, slate, and limestone. This land is probably the edge of Antarctica, which therefore occurs 400 miles farther north than the position suggested for it on Sir John Murray's sketch map. Murray had extended the Weddell Sea thus far to the south, as the natural inference from the reported soundings, which had been greatly exaggerated by Ross's primitive appliances. Where Ross reported no bottom at 4000 fathoms, the *Scotia* found blue mud at the depth of only 2660 fathoms. The *Scotia* has removed Ross's Deep from the chart. During the return voyage the *Scotia* visited Gough Island, which was found to be volcanic, and after calling at Cape Town, Saldanha Bay, and various

Atlantic islands, it arrived back in the Clyde in July, 1904.

The narrative of the expedition is told by three members of the staff, Mr. R. C. Mossman, the meteorologist and magnetic observer; Dr. J. H. H. Pirie, the medical officer and geologist; and Mr. R. N. Rudmose Brown, the botanist. Each author contributes the chapters describing the work with which he was most concerned. The book perhaps suffers as literature from the difference in treatment of successive chapters, but it has the advantage of describing the whole expedition by the first-hand accounts of men concerned in all the different sections of the work.

The narrative is of great interest. It tells the story of long, thoughtful preparation, of the setting forth of a band of determined men, each well trained in his own line of work, and of their quiet, successful achievement of their purpose. The expedition must be regarded, especially in view of its low cost, as remarkably successful. Its discovery of Coats Land determined the hitherto quite unknown southern limit of the Weddell Sea, and has broken the longest unknown line in the coast of Antarctica. As far as can be judged from published information, the *Scotia* will probably be found to have contributed more to Antarctic oceanography and biology than any of the expeditions in the field at the same time. Its deep-sea equipment was excellent, and was fully used, and the description of the quantities of material obtained in the deep-sea hauls justifies the hope that the biological collections will yield most important contributions to our knowledge of the Antarctic fauna.

J. W. G.

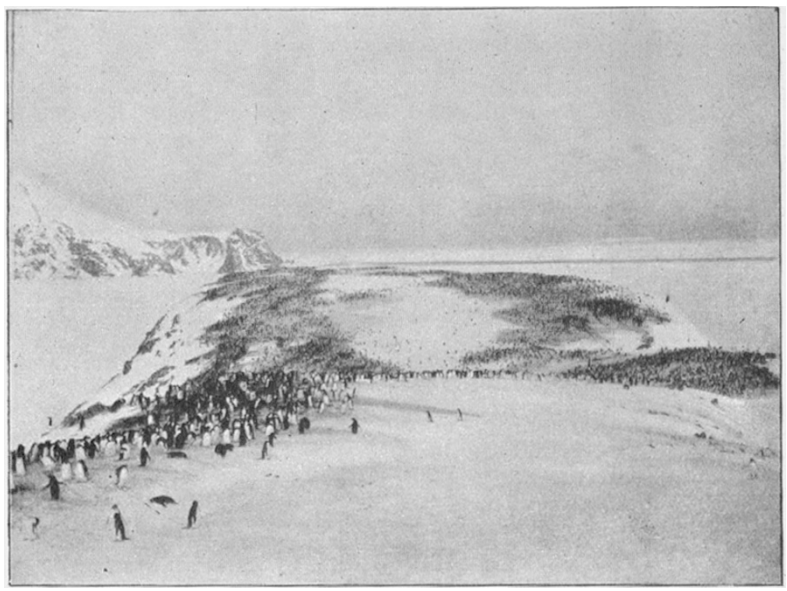

FIG. 2.—Penguin rookery on Graptolite Island. From "The Voyage of the *Scotia*."

SYNTONIC WIRELESS TELEGRAPHY.

ON Tuesday evening, at a reception given by Lord Armstrong at the Queen's Hall, Sir William H. Preece, K.C.B., F.R.S., being in the chair, a very important and interesting demonstration was given by Mr. Valdemar Poulsen before a large audience, which included, among others, H.R.H. the Duchess of Argyll, the Duke of Argyll, and the Danish Ambassador, of a new development of wireless telegraphy which affords grounds for hoping that the problem of syntonic signalling is at last nearing practical solution.

Mr. Poulsen will be familiar to readers of NATURE as the inventor of the telegraphone (see NATURE, vol. lxii., p. 371, and vol. lxiv., p. 183). Before describing the experiments shown at the Queen's Hall, it will be advisable to give a short account of the principles on which the new method is based. It has often been pointed out in NATURE that all attempts hitherto made with regard to selective signalling are of a very unsatisfactory nature, and it has been suggested (NATURE, vol. lxviii., p. 249) that the solution is likely to be found in the application of the principle discovered by Mr. Duddell in the "musical" or "singing" arc. It is precisely that principle that Mr. Poulsen has adopted. The reason for this is sufficiently clear when it is considered that syntony, or tuning between transmitter and receiver, means the emission by the transmitter of sustained vibrations of definite frequency. Only when these are produced is it possible to employ in the receiver a circuit tuned or resonating to this particular frequency.

The main difficulty with all methods of spark transmission is to produce these sustained vibrations. The signal produced by a spark discharge consists of a series of violent pulses each consisting of a short train of strongly damped vibrations of definite frequency. Such tuning as can be done is accomplished by making the natural period of vibration of the receiving circuit the same as the vibration period of the individual pulses, but as the effect of the pulse itself as such is practically as great as that of its component vibrations, it will be readily seen that the tuning is only partial. To make the syntonisation effectual, the effect of the pulse must be diminished and that of the vibrations increased. In order to do this, the damping of the vibrations must be lessened until the signal is no longer a series of rapidly damped waves, but becomes a continuous succession of undamped, or, at the worst, very slightly damped vibrations, and the culminative effect of the continuous succession of waves will be far greater.

The problem, therefore, reduces itself to the production of a train of undamped waves, and the manner of its solution was indicated by Mr. Duddell when he discovered the phenomenon of the singing arc (NATURE, vol. lxiii., p. 182). Mr. Duddell showed that if a continuous current arc, burning under such conditions that a small rise in the current is attended by a small fall of potential—or in symbols for which dv/dA is negative and numerically greater than the resistance of the shunt circuit—is shunted by a circuit containing self-induction and capacity, there is spontaneously set up in that shunt circuit an alternating current the frequency of which is determined by the "natural" frequency of the circuit. By the use of different inductions and capacities Mr. Duddell produced alternating currents of various frequencies causing the arc to emit a musical note. The frequency of these vibrations was, however, low—as is shown by the fact of the arc emitting a note—and in wireless telegraphy the frequency must be high. Mr. Poulsen has found that by burning the arc in an atmosphere containing hydrogen, by lengthening the