

the globe; what Government will do when it takes such work in hand, we have a good example of in the *Challenger* expedition.

There is now such a vast stock of experience in Arctic exploration from which to derive lessons for guidance as to the equipment of the new expedition, that we have every assurance the new expedition will be organised in such a manner as to secure the maximum of efficiency with the minimum of danger and discomfort. But, indeed, Mr. Markham has clearly proved, in his "Threshold of the Unknown Region," that the cry of danger has no foundation whatever, and his statement is only confirmed by the three most recent and by no means adequately equipped expeditions, those of the *Polaris*, the *Germania-Hansa*, and the *Teggethof*.

It is calculated that the expedition will cost about 30,000*l.* a year, "which," as the *Daily News* justly says, "is surely a very moderate expenditure for an object so important. The officers and men of the expedition will belong exclusively to the Royal Navy; the former will be selected for their scientific qualifications, and will at once enter on the study of the special subject, a knowledge of which the purposes of the expedition demand." No doubt, then, every branch of science on which exploration near the pole of the earth is likely to throw light will have a competent representative on the staff; and here we would urge upon the organisers the great importance of the spectroscopic examination of the aurora in those regions where often it can be studied almost nightly; no doubt there will be some competent man on board to look after this investigation.

From this expedition, then, entered on after the most mature deliberation, and likely to be organised on the most liberal basis, science may expect to reap a rich harvest. To quote the concluding words of the article already referred to: "As the object of the expedition is not merely to reach the pole, there will be no hurried racing to attain that point. The whole phenomena of the polar area is of deep and still mysterious interest. The opportunity now is within reach to lay open to the scientific world a mass of invaluable data relating to the region which lies concealed behind the 80th parallel of latitude and within an area of two million square miles. It may be shown that no such extent of unknown area in any part of the world ever failed to yield results of practical as well as of purely scientific value; and it may be safely urged that, as it is mathematically certain that the area exists, it is impossible that its examination can fail to add largely to the sum of human knowledge."

#### OBSTACLES TO SCIENTIFIC RESEARCH

SOME remarks with which Prof. M'Nab prefaces a paper "On the Movements of Water in Plants," recently published in the Transactions of the Royal Irish Academy, deserve serious consideration as an instance of the obstacles which exist in the way of scientific research in this country quite apart from the personal difficulties of those who may wish to engage in it. He complains that "the chief difficulty I have had to contend with has been the impossibility of obtaining in Dublin, in the same locality, the two essentials for experimenting, namely, a laboratory and a botanical garden. The appliances of a

chemical laboratory must be within easy reach of the plants to be experimented on; if not, then errors are sure to be made; and as much time would necessarily elapse between procuring the plant for experiment and the commencement of the experiment itself, the results obtained would certainly be untrustworthy. In fact, the nearer the plants are to the laboratory the better; the results will be more accurate, and the experiments much more easily performed. . . . A large number of most interesting and valuable experiments might be made if only a few pieces of apparatus could be placed near the plants to be experimented on. A balance, a water-oven, spectro-scope, and the like, are essential; while the few chemicals and small pieces of apparatus could easily be had. There can be little doubt that the reason why so few physiological experiments are made in this country is to be looked for in the absence of the necessary laboratory accommodation near our gardens. In Germany and France the agricultural stations supply most of the researches in vegetable physiology. Here, however, all depends on private enterprise; and when there is an observer capable of undertaking experiments, he may not be willing to incur the expense of supplying plants and apparatus."

At the present time there is no place in the whole country where facilities for investigations in Physiological Botany are in any way afforded. Even Vegetable Chemistry is confined to the laboratories at Cirencester and Rothamstead, both private property and with a scope somewhat limited by their immediate relation to agriculture. Besides these it would be hard to mention, even in the whole British Empire, any other place where this kind of research is carried on, unless we except the Government manufactory of cinchona alkaloids under Mr. Broughton's charge on the Nilghiris, which has yielded, incidentally, new information on many interesting points. It is true that the Science Commission has reported in favour of opportunities for the pursuit of investigations in Physiological Botany being afforded in the Royal Gardens at Kew. But there seems but faint hope of anything of the kind being done—or in any adequate way. Even the action of our Universities, munificent as it has been in some directions, has been reactionary in this. As long as Dr. Daubeny was Professor of Botany at Oxford, the small chemical laboratory belonging to Magdalen College, adjacent to the Botanical Garden, was available for purposes of research of this kind. Now it is separated altogether, and used for purposes of college instruction. And it may be added that this laboratory will always be a classical spot as having been the place where the first researches on the relation of light of different degrees of refrangibility to the elimination of oxygen from tissues containing chlorophyll were carried on. Hunt, Draper, and Sachs have arrived at a better knowledge of the subject, but Daubeny was able to show first that the effect is principally due to the influence of rays in the neighbourhood of the yellow portion of the spectrum, and that those of higher refrangibility are practically destitute of any influence in the matter—a result, even now, that it is firmly established far indeed from being *à priori* explainable.

So much has now been clearly worked out in respect to the physical details of the "vital" processes of plants,

that it would be eminently desirable to have in each of our older universities the very simple and moderate accommodation attached to their botanic gardens which is needed, if only for giving students an opportunity of going over for themselves biological phenomena so fundamental in their general character and so comparatively easy to investigate.

#### THE SECOND GERMAN ARCTIC EXPEDITION

*The German Arctic Expedition in 1869-70, and Narrative of the Wreck of the "Hansa" in the Ice.* By Capt. Koldewey, Commander of the Expedition, assisted by members of the Scientific Staff. With numerous Woodcuts, two Coloured Maps, two Portraits on Steel, and four Chromolithographic Illustrations. Translated and Abridged by the Rev. L. Mercier, M.A. Oxon; and edited by H. W. Bates, F.L.S., Assistant Secretary, R.G.S. (London: Sampson Low and Co., 1874.)

THIS well-told and extremely interesting narrative of the fruitful German expedition to East Greenland in 1869-70 strongly confirms what we have said in our leading article with regard to the necessity of Government undertaking arctic exploration in order that it may be carried on with the greatest efficiency, the wisdom of choosing the route by Smith's Sound, and the valuable results that may be looked for from an expedition organised on a broad and liberal basis and carried out in a thoroughly systematic manner.

This expedition was initiated at Bremen shortly after the return of the first German Arctic Expedition, by Dr. Petermann, Capt. Koldewey, and a few others who are eager to advance the exploration of the polar regions, the object being to penetrate into the still unknown heart of these regions, making the east coast of Greenland the basis of operations. An elaborate plan of exploration was drawn out, which included the solution of nearly all the questions with respect to the arctic regions that yet remain unsolved. The funds were to be raised by public subscription, and the large committee of eminent scientific men who undertook the organisation of the expedition worked enthusiastically to get it set afloat. The scheme was well received by the German public. It was calculated that the whole expenses of the expedition would amount to 10,500*l.*, and we are glad to see that all this was obtained, and even additional expenses paid off after the return of the expedition.

As might be surmised, this sum was adequate for only a modest expedition; it is calculated that our Government expedition will cost at least six times that amount. Two small vessels were procured to carry the members of the expedition, the *Germania* and *Hansa*, the latter to act as tender to the former. The *Germania* was built expressly for the purpose, was a small two-masted screw steamer of 143 tons burden, thoroughly well sheathed and adapted for ice-navigation; for a ship of its size, indeed, it could hardly have been better fitted than it was to struggle with all the dangers of ice-navigation. The *Hansa* was a schooner of 76 $\frac{3}{4}$  tons burden, which had been built in 1864; as she was to act as tender to the *Germania*, she does not seem to have been so strongly armed as the

latter. The internal fittings, provisioning, and general equipment were all that could be desired, considering the modest sum with which the organisers had to work.

The commander of the expedition was Capt. Koldewey, thirty-two years of age, an experienced arctic navigator and an enthusiast for arctic exploration, who by scientific study had added to his practical qualifications for the command of such an expedition; Capt. Hegemann ruled on board the *Hansa*. The narrative of the expedition contains a brief sketch of the career of each of the scientific members of the expedition, all of whom seem to have been well qualified for their particular work. Physics, astronomy, botany, zoology, geology, and geodesy each had its representative, and on the whole we are bound to say the interests of each department were well cared for. One of the most efficient and hardest working members of the expedition was Lieut. Julius Payer, then twenty-seven years old, and now so famous in connection with the successful Austro-Hungarian expedition. There was an Englishman on board, Dr. Copeland, who, along with Dr. Börgen, undertook astronomical and physical science, as well as geodesy. Dr. Pansch was well qualified to look after the botany; and Prof. Dr. Laube, of Vienna, was zoologist on board the unfortunate *Hansa*. Still, the narrative must forcibly impress any careful reader with the idea that the scientific staff was far from adequate for the work of thorough arctic exploration; officers and men worked heart and soul to carry out the objects of the expedition, and the results obtained are well worth the money expended; but at almost every step it was evident that the work was greatly hampered for want of men.

The two ships, with well-assorted staffs and crews, left Bremerhaven on June 15, 1869, in presence of his Majesty the King of Prussia, who showed the warmest interest in the expedition. They went joyously on their journey, everyone on board in excellent spirits, the scientific staff making what observations were possible on the life and temperature in sea and air. This part of the narrative, as indeed the whole story of the expedition, is told with a most charming simplicity and freshness, which has been well kept up in the English abridged translation. The solitary and rugged Jan Mayen was sighted on July 9, but the almost eternal mist forbade any attempt at landing. Both *Germania* and *Hansa* struck the ice on July 15, the former in 74° 47' N. lat. and 11° 50' W. long., and the latter in 74° 57' N. and 9° 41' W. The two ships had lost sight of each other on July 10, and did not meet again till the 18th, keeping in sight of each other among the ice till the 20th. On that day the *Germania* signalled to the *Hansa* to come within hail, which unfortunately Capt. Hegemann misunderstood, and kept further off; the two ships did not meet again. Up to this time they had been sailing northwards, mostly in dense fogs, trying to find an opening through which they might penetrate through the ice-line, so as to get as near the land as possible. As no favourable opening could be found, the ships turned southwards, agreeing to meet at Sabire Island. Shortly after the *Hansa* got caught among the ice, with which she continued to struggle heavily, and by August 14 was hopelessly involved in the impenetrable masses. From this time she was at the mercy of the ice, with which she drifted south until Oct. 21, when, in 70° 52' N. and 21° W., she was crushed between the heavy