## Three Arctic Expeditions in 1931

IN the summer of 1931, three expeditions using very different equipment visited adjacent regions of the arctic, and Prof. H. U. Sverdrup has summarised the preliminary results obtained and compared the usefulness and prospects of the different methods employed. The Swedish-Norwegian party under the leadership of Prof. H. W:son Ahlmann relied upon the old proved technique and carried out oceanographical work from the *Quest* in the neighbourhood of Franz Josef Land and Spitsbergen (North-East Land) together with dog and sledge journeys across North-East Land, which was shown not to be covered with a continuous ice sheet as formerly believed, but to be divided into two ice areas by a broad ice-free valley. Large geological and botanical collections were made, and the study of these and of the meteorological and oceanographical observations is proceeding.

The other expeditions with submarine and airship were financed by the Press, and for this reason and on account of the novel means employed, they received wide publicity. An American Press magnate who was interested in Wilkins's submarine (*Nautilus*) project had offered to finance the Zeppelin flight on the understanding that the air-ship should attempt to establish contact with the submarine near the north pole, but when the *Nautilus* was delayed by an unlucky Atlantic crossing, this plan had to be abandoned and the support for the flight was not forthcoming. Fortunately the commander, Dr. Eckener, was able to come to a favourable understanding with the German Press, and although the original plans developed by Nansen of a flight across the pole could not be entertained, a cruise to Franz Josef Land and to Nicholas II. Land off northern Siberia was successfully accomplished.

* *Naturen*, 1932, p. 86.

The Zeppelin trip from Leningrad only occupied four days. At Franz Josef Land the airship descended to the water and exchanged mails with the Russian ice-breaker *Malgyin*, and this—the first 'landing' to be made without ground parties—demonstrated the usefulness of the ship as a transport vessel to uninhabited regions. One of the unknown dangers of the expedition was the possibility that ice would be precipitated from the clouds on to the great envelope of the airship and force it down, but this was not realised, because throughout the cruise the temperature of the air passed through was above 0° C., being higher at 1000 m. than at the earth's surface. This temperature inversion, well known to exist in winter, Prof. Sverdrup thinks, may not always obtain in summer, and he anticipates different conditions in the Atlantic quadrant of the polar area from those over the Siberian and Alaskan quadrants, and issues a warning against generalising from this limited experience.

FIG. 1.—Panorama of the Taimyr Peninsula. The shadow of the *Graf Zeppelin* is seen near the middle of the right half of the picture.

For the first time, radio *ballons-sondes* devised by the Russian meteorologist Moltschanof were used to obtain observations of the upper atmosphere. These balloons are equipped with small radio-transmitters sending out signals from which temperature and humidity values are obtained for different altitudes, thus furnishing instantaneous records in regions where there is little hope of the recovery of instruments. Four balloons were dispatched, of which three reached an altitude of more than 16 km., and it was found that at about lat. 80° the temperature of the stratosphere (with its base at 10·4 km.) was −50° C. In summer the average height of the stratosphere in Europe is 11 km. The *Maud* expedition in the spring months obtained a value of 8·5 km. north of Siberia, and Prof. Sverdrup suggests that whereas in general the

height of the stratosphere falls off from the equator to the pole, its minimum altitude, which may be styled the meteorological north pole, does not coincide with the geographical pole but lies between it and Siberia and Alaska. Photographs were taken which will be of assistance in improving the maps of Novaya Zemlya and Franz Josef Land, and it was discovered that Nicholas II. Land is divided into two by a broad strait which has now been mapped on the ground by the Russian geologist, N. N. Ourvantzev.

The good fortune which followed the Ahlmann and Eckener expeditions was denied to Wilkins's submarine venture, in which Prof. Sverdrup himself took part. On reaching the pack ice north of Spitsbergen, it was found impossible to dive, on account of the loss of the vertical rudder: the main project—to test the feasibility of navigation under the ice—was unfulfilled, and instead of a submarine the explorers found themselves in a ship very unfitted for ice work. Nevertheless, a large number of echo soundings and a series of gravity measurements were made, oceanographic stations established, and bottom samples brought up from depths down to 3500 m. From the character of the deeper water, further evidence was obtained in support of Nansen's deduction that the submarine ridge trending north-west from Spitsbergen descends to 1500 m. between Spitsbergen and Greenland.

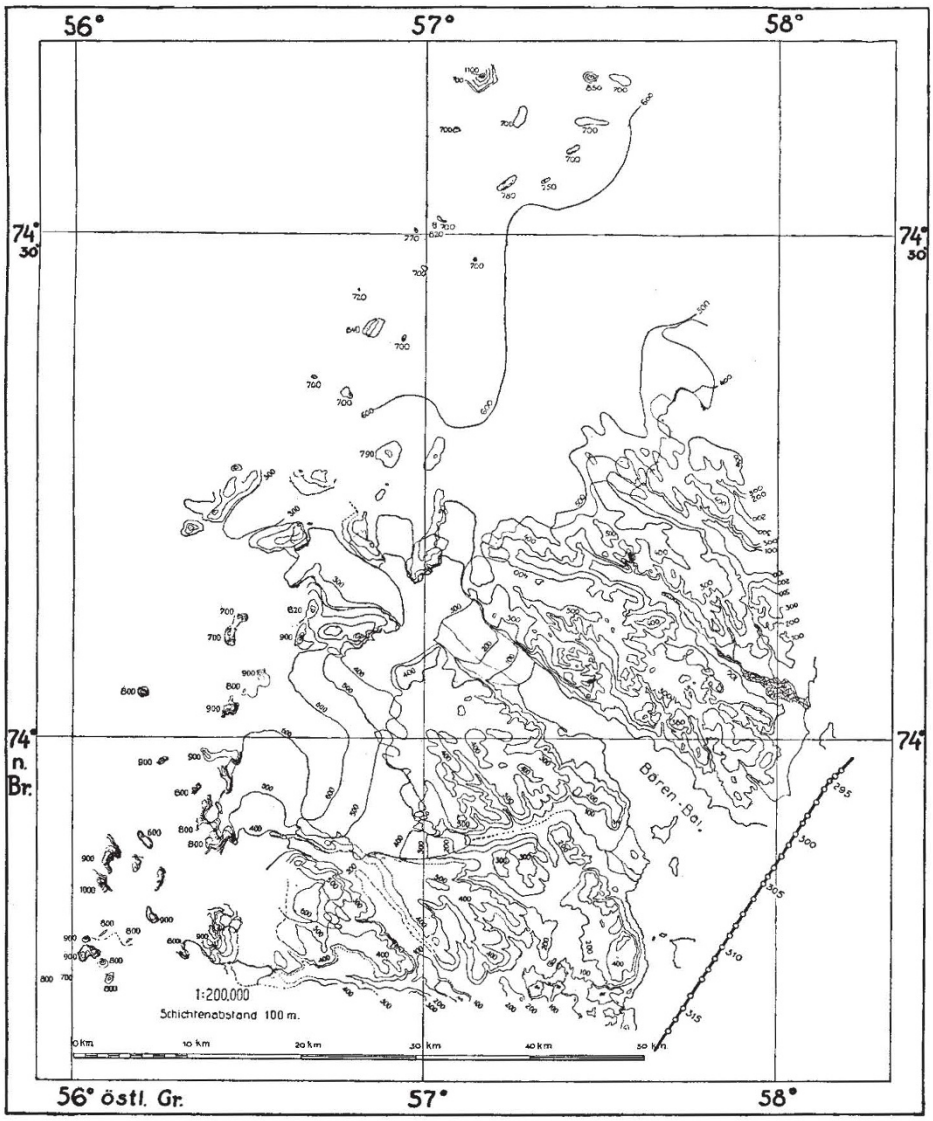


FIG. 2.—Map of part of south-east Novaya Zemlya made from the *Graf Zeppelin* survey.

The conclusion is reached that the old polar technique still maintains its superiority, for there is no doubt that when the results are worked out, those of the Ahlmann expedition will prove the richest; but the airship has definitely 'arrived' and one can confidently anticipate further developments of its usefulness in this field of exploration. Judgment cannot yet be passed upon the submarine—a better boat than the *Nautilus* must be available—but Prof. Sverdrup is of the opinion that "the U-boat will prove the ideal means of travel across the polar sea in summer, and that with the U-boat it will be possible to obtain full knowledge of the oceanography of the Arctic".

A description of the photographic apparatus carried by the *Graf Zeppelin* and an account of the methods employed in the preparation and orientation of maps based upon the photographs has been given by Otto V. Gruber,* from whose paper the accompanying illustrations are produced by courtesy of Messrs. Carl Zeiss, Ltd. The general procedure is similar to that which is adopted in aeroplane photogrammetric surveys. One of the addi-

* "Über die photogrammetrische Ausrüstung des *Graf Zeppelin* auf der Arktisfahrt 1931 und die Auswertungsmethoden für das gewonnene photogrammetrische Beobachtungsmaterial." *Bildmessung und Luftbildwesen*, No. 4, 1931. (Liebenwerda, Sachsen: R. Reiss G.m.b.H.)

tional advantages of operating from an airship is that under favourable conditions the shadow of the vessel appears on the photographs (Fig. 1), thus providing a control over the orientation and scale of the map.

As an example of what can be accomplished by airship survey, we reproduce the map (Fig. 2) of a part of south-eastern Novaya Zemlya showing the coastal region and the inland ice. The map is on the scale of 1/200,000 with contours at 100 m. intervals, and the errors in scale and height are stated not to exceed 10 per cent—probably not 5 per cent. The latitude and longitude may be as much as 1° out, and to correct this it would be necessary to determine by astronomical methods on the ground the true position of some point identifiable on the photographs, or to extend these to include some known point. L. H.

## Obituary

### SIR DORABJI TATA

IN the memorial to his wife which he settled shortly before his death on June 4, Sir Dorabji Tata described himself as "The Last of his House". That is painfully true; with his passing an end comes to a family which played a great part in the intellectual and industrial renaissance of India.

Dorab Tata's rôle in this was that of the executor rather than the creator. The pioneering was done by his father, Jamsetji Tata. Having founded the family fortune firmly by establishing a prosperous cotton-spinning business, he bent his adventurous talents to three great enterprises—the establishment of an Institute of Science to prepare Indians for the direction of modern large-scale industries; the construction of iron and steel works as an essential link in the economic cycle; and the harnessing of the prolific rainfall of the Western Ghats to electric power stations to relieve the dependence of Bombay on far-distant coal-fields. But he died before any had reached the final stage; on the contrary, the freedom with which he spent on the development work rather seriously 'locked up' the family resources.

At this stage Dorab Tata took control of the business. With the active sympathy of his brother, the late Sir Ratan Tata, he set himself the filial task of completing his father's work. After many discouragements, thanks to the co-operation of Lord Curzon and the Government of India, the Institute of Science was established at Bangalore. Thence a steady stream of well-trained Indians has passed into the service of Indian industry. Unfortunately, Bangalore, though admirably suited climatically, is so far from the industrial centres that its activities do not command the interest and support which they should receive; but the work goes on.

The history of the Iron and Steel Works at Jamshedpur reads like a romance. The dogged tenacity with which Dorab Tata and his expert advisers searched the Central Provinces for ore surprised even his closest friends; for he was born to easy days. When their patience was rewarded by the discovery of a hill of iron ore of the finest quality at Gurumashini, the quest for capital was as baffling as that for "The Golden Girl". British enterprise does not come well out of the test. Though the existence of the requisite materials was established beyond doubt, and the home market justified the establishment of large-scale manufacture, British capital was timid and exacting, and no progress was possible. Fortunately, on the crest of the *swadeshi* wave India took this opportunity to itself and subscribed the money with an ease which surprised everyone; but equipment and operation were American and German when the British industrialist and financier missed their opportunity.

The same wave of constructive enthusiasm launched the hydro-electric works with Indian capital. Though the three associated companies—the Tata Hydro-Electric, the Andhra Valley, and the Tata Power—are capable of delivering electrical energy in Bombay far beyond the capacity for absorption, the heavy capital cost, especially during construction, has not given industry the cheap power which it demanded.

Here Dorab Tata himself would have been glad to call a halt. He was a rather reluctant partner in the manifold activities into which his house launched, and which brought anxious days when the post-War reaction set in. But he rose to the occasion and placed his private fortune behind the Iron and Steel Company when the dark days came, and, backed by the indomitable courage of his cousin, the late Mr. R. D. Tata, weathered the storm.

The qualities which Dorab Tata brought to this work were those of tenacity rather than of originating power, and a fine financial integrity. He was always willing to pay for brains, even extravagantly if he got the best. His monument is the Institute of Science, with its encouragement of pure industrial research, and the iron and steel industry, with linked enterprises, which has created a hive of industry in the virgin forests of Chota Nagpur. The contribution of his house to the renaissance of India is the recognition of the indispensability of science to modern industry, and the patriotic vision which looked beyond 'penny-in-the-slot' enterprise to the foundation of key industries, which though expensive are essential to the economic cycle.

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### DR. B. A. BEHREND

DR. BERNARD ARTHUR BEHREND died on March 25 this year, in Wellesley Hills, Mass., at fifty-six years of age; and a correspondent who knew him intimately has sent us the following appreciation of his life and work, to supplement the many memoirs which have appeared in our engineering contemporaries.

Behrend was a man of the widest interests, and