Jan Mayen Island
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the number of cameras carried and to curtail weight. On that account I advocated the quarter-plate camera ; but should one be interested only in landscape photography, then the 7 × 5 camera should certainly be used in addition to the quarter-plate. As regards devices for estimating correct exposure I have always found the actinometer type of exposure meter most useful. The actinometer actually measures the intensity of the light at each occasion. Tables of light values are unreliable in my opinion.

The PRESIDENT: I should like those present here to have a look at the photographs round the room, which are the best of the photographs taken on the Mount Everest Expedition. Many were taken with a $7\frac{1}{2} \times 5$ inch camera. I think you will agree with me they are excellent results, especially those photographs of Makalu. What interested me particularly in Captain Noel's paper was his expression of views in regard to colour photography ; I was sorry to hear it is not possible to get good results by colour photography for landscape work, because we are particularly anxious to secure these beautiful colour effects to be found in the high mountains, which are exceedingly delicate and very hard to reproduce. But at any rate for flowers and other subjects in which there are very distinct colours, colour photography will be of great value. On this next year's expedition we shall have, I hope, the advantage of all the skilled advice which was so freely given on the present expedition, and we intend this time to send out a really experienced photographer—as experienced as Captain Noel himself, and with the same experience in the field—and we shall hope that next year we may perhaps have even better results than we have here at present. I am sure you will wish me on your behalf to thank Captain Noel most warmly for his valuable lecture.

JAN MAYEN ISLAND

J. M. Wordie

Read at the Meeting of the Society, 21 *November* 1921.

Historical.

COMPARED with other Arctic islands Jan Mayen is small in size and has no doubt suffered on that account ; on the other hand, the extinct volcano of Beerenberg, with the exception of certain nunataks in Greenland, is the highest mountain within the Arctic circle. The smallness of the island has probably deterred many an intending visitor, who has gone instead to the more distant and more ice-surrounded Spitsbergen. The mineral wealth of the latter, moreover, gives to it a status which the barren Jan Mayen can never acquire ; but at one time, during the period of Dutch whaling supremacy in the seventeenth century, these two islands were rivals in economic importance. To-day the situation is very different.

Jan Mayen has a reputation, in Britain at any rate, for being cloud-covered and hard to locate. This is probably an exaggeration, for the summit of Beerenberg is generally clear, and is a striking landmark visible from more than 100 miles away. The words "mist obscured" could with more fitness be applied to the early history of the island.

In the Icelandic "Landnámabók" it is written that "from Langanes on the north side of Iceland it is four doegr's sea to Svalbard [*i.e.* the cold coast] on the north in Hafsbotn." By "Hafsbotn" the early Scandinavians meant the end of the sea to the north of Norway and north-east of Greenland; in a similar way they speak to-day of "Ishavet." A doegr was twelve hours' sail. The chronicler therefore meant that "Svalbard" was forty-eight hours' sailing distance from the north of Iceland. As the distance from there to Jan Mayen is 288 and to Spitsbergen 840 nautical miles, there would seem to be little doubt that it is the former island that is meant. This is not the view held generally by Norwegian historians, and among them Dr. Nansen. Dr. Nansen, as I read him, puts forward only one serious objection to Svalbard being accepted as Jan Mayen, namely, that the term "cold coast" would only be applied to the coast of a larger country. It is surely fair, however, to suppose that Svalbard would, whatever its size, be the coldest coast known to the early Scandinavians: this might be Jan Mayen so long as Spitsbergen was undiscovered. A further argument against Spitsbergen being Svalbard is the absence of strong proof of walrus-hunting by the early Norsemen, as would certainly have occurred had Svalbard been Spitsbergen: the latter is a favourable field for walrus, Jan Mayen not at all. That Svalbard, despite the weak evidence, is still generally claimed as being Spitsbergen finds a ready explanation in the desire at present shown by Norway to establish an historical as well as a geographical claim to that group. A similar failing was once shown by Dutch and English writers in assessing the rival claims of their countrymen to priority of discovery in Spitsbergen and Jan Mayen in the beginning of the seventeenth century.

When in the fourteenth and fifteenth centuries Norway declined as a seafaring nation and the important Greenland colonies were neglected, the existence of the much less important Svalbard or Jan Mayen was soon forgotten. Its rediscovery dates from the seventeenth century, during the time when the English and Dutch were rivals on all the Arctic whaling grounds. Owing to this trade rivalry it is not always certain whether contemporary statements can be treated as reliable or whether some may not be forgeries. The discovery of a new field such as Jan Mayen might moreover be kept secret on economic grounds. In this country Hudson has generally been looked on as the discoverer, but in Holland Jan Jacobsz May has always been given the credit. The facts can speak for themselves.

Thomas Edge, in his "Briefe Discoverie of the Northerne Discoveries of Seas, Coasts and Countries etc.," printed in 'Purchas His Pilgrimes,' says:

> In the yeere 1608, the said fellowship set foorth a Ship called the Hope-well, whereof William Hudson was Master, to discover to the Pole, where it appeareth by his Journall, that hee came to the height of 81.

> degrees, where he gave Names to certayne places, upon the Continent of Greenland formerly discovered, which continue to this day, namely, Whale Bay, and Hackluit Headland, and being hindred with Ice, returned home without any further use made of the Countrey, and in ranging homewards hee discovered an Iland lying in 71. degrees, which hee named Hudsons Tutches.

The above relation by Thomas Edge is obviously incorrect. Hudson's Christian name is wrongly given, and the year in which he visited the north coast of Spitsbergen was 1607, not 1608. Moreover, Hudson himself has given an account of the voyage and makes absolutely no mention of Hudson's Tutches. It would have been hardly possible indeed for him to visit Jan Mayen on his way home from Bear Island to the Thames. It is true that Hudson on his way to "Hold with Hope" discovered a headland to which he has given the name Youngs Cape, and near it "a very high Mount like a round Castle" which he called Mount of Gods Mercie. Neither of these places can be absolutely identified, but they are certainly not on Jan Mayen and are probably somewhere on the coast of Greenland. There is no justification, therefore, for accepting Edge's narrative; it has never been substantiated. A possible explanation might be that the island had been discovered by Hull men, but its discovery kept secret: rumour might account for this garbled version by Thomas Edge.

The account of the Dutch discovery of the island is much more reliable. A document bearing the date 29 August 1615 is preserved in the Dutch Archives at the Hague. It is a request to the States General by the Noordsche Compagnie to have the discovery accepted as made in July 1614 by their two ships *De goude Cath* (the Golden Cat) and *Den Orangienboom* (the Orange-tree). Jan Jacobsz May was captain of one of these ships, Joris Carolus mate. The company had been forced to put forward this claim, as a ship captained by Jan Jansz Kerckhoff and owned by a rival company had also visited the island that same summer.

May's discovery is confirmed by the finding in recent years in the *Depôt des Cartes de la Marine* in Paris, of the original map drawn by Joris Carolus himself in the year 1614, and on which he calls the island after himself, "Mr. Joris Eylandt." This map has been reproduced in Dr. Wieder's 'Dutch Discovery and Mapping of Spitsbergen.' It also marks North-east Cape as "Jan Meys Hoeck" and Driftwood Bay as "Gouwenaers Bay." It is interesting to find that the mate's naming of the island after himself was soon replaced (Blaeu, 1623) by the more appropriate captain's name.

The first authentic English visit is that of Robert Fotherby in 1615. Believing the island was a new discovery, he called it Sir Thomas Smith's Island. His description given in Purchas is as follows:

> This Iland is about ten leagues in length, and stretcheth North-east and South-west: it is high Land, and at the North end of it there is a

Mountayne of a wonderfull height and bignesse, all covered with Snow, which I called Mount Hackluyt ; the base or foot of it on the East side is almost foure leagues long, it hath three such sides at the base lying out to the Sea, and from the fourth side doth the rest of the Iland extend it selfe towards the South-west, which is also, as it were, a place fortified with Castles and Bulwarkes, for on each side there bee three or foure high Rockes which stand out from the Land, appearing like Towres and Forts. It lyes in the parallel of 71. degrees, where the Needle varieth from the true Meridian Westwards eight degrees. The Land is generally so farre as I have seene, Rockie and very barren, and worse than the Land that I have seene in King James his New Land, under eightie degrees, for there is no grasse but mosse, and where I first landed upon low ground, all the stones were like unto a Smiths sinders both in colour and forme, the sand is generally mixed with a corne like Amber ; the Beaches are abundantly stored with drift wood and many stones, like light Pumis, which will swimme on the water. I saw many traces of Foxes and the footing of Beares, but not any signe of Deere or other living creatures, and very small store of Fowle.

It is a duty to quote the above account in full: one is filled with admiration for the shrewd seaman who noted even the olivine crystals so common in the beach sand. Bears are no longer found on the island; otherwise the description holds good to-day and might well be quoted in the Admiralty Pilot. It seems a pity that Fotherby was forestalled by the Dutch the previous year: "Mount Hackluyt," however, has priority in name over Beerenberg. This is the same Fotherby who is quoted by Purchas as saying (before 1625), "the Dutch have beene a bane to this Trade and Discoverie: The Hull-men have done some bad service in this Action, for they were the first that carried the Dutch to the Tutches, as by Wivendens Oath and Journall appeares." This outburst of Fotherby's may perhaps give the clue to the early history of the island. At the time he wrote the words just quoted he must have known the whole history of the island, and it is important therefore to note that he chooses the name Tutches from among a host of others. May's discovery in 1614, however, still remains the earliest well-authenticated one. Of the other claimants, Hull whalers (possibly Thomas Marmaduke) are said to have discovered it in 1611 or 1612 and to have called it Trinity Island. Jean Vrolicq, the Biscayan, said he visited the island in 1612, and called it Isle de Richlieu. Other old names are Young's Foreland, Mauritius, and Pico.* The truth of these claims has still to be settled. Meantime it seems appropriate that the often-named island has finally settled down under the name of its first authentic discoverer.

* Sir Martin Conway, 'No Man's Land,' 1906. S. Muller Fz., 'Geschiedenis der Noordsche Compagnie,' 1874. M. Charles Rabot mentions a manuscript map in Bergen of date 1610 with the island inserted.

I am indebted to Dr. Wieder for the positive information concerning Jan Jacobsz May's voyage.

Whaling was begun by the Dutch in 1616. In 1618 there were as many as nineteen Dutch whalers at the island. Vats were built ashore where the blubber could be rendered down. In some places their foundations are still visible: a few thin bricks can be found or perhaps a small heap of coal. A Dutch painting dated 1639 and reproduced in the *Geographical Journal*, vol. 31 (1908), p. 645, shows one of these Dutch "cookeries" in full activity. The busy scene in that picture is in striking and amusing contrast with the desolate nature of the west coast nowadays. The fishing off the island was very rich by all accounts. The Dutch had pretty much their own way generally on Jan Mayen; but in August 1632 Jean Vrolicq descended on the unguarded stations and pillaged them. The Dutch therefore left a guard the next year (1633–4), but all of them died of scurvy. The journal and daily weather notes of the unfortunate party have been printed several times. Soon afterwards the fishery appears to have suddenly declined. When Zorgdrager visited the island in 1699 he found most of the equipment left as if the owners had expected to return.* Some bad ice years may have happened just then, and in the interval the whalers may have found better hunting-grounds.

The island must still have been visited frequently by whalers working the "vestis" in the eighteenth century and early part of the nineteenth. Nowadays sealers going to and from Denmark Straits and Scoresby Fiord occasionally put in for water or to take shelter.

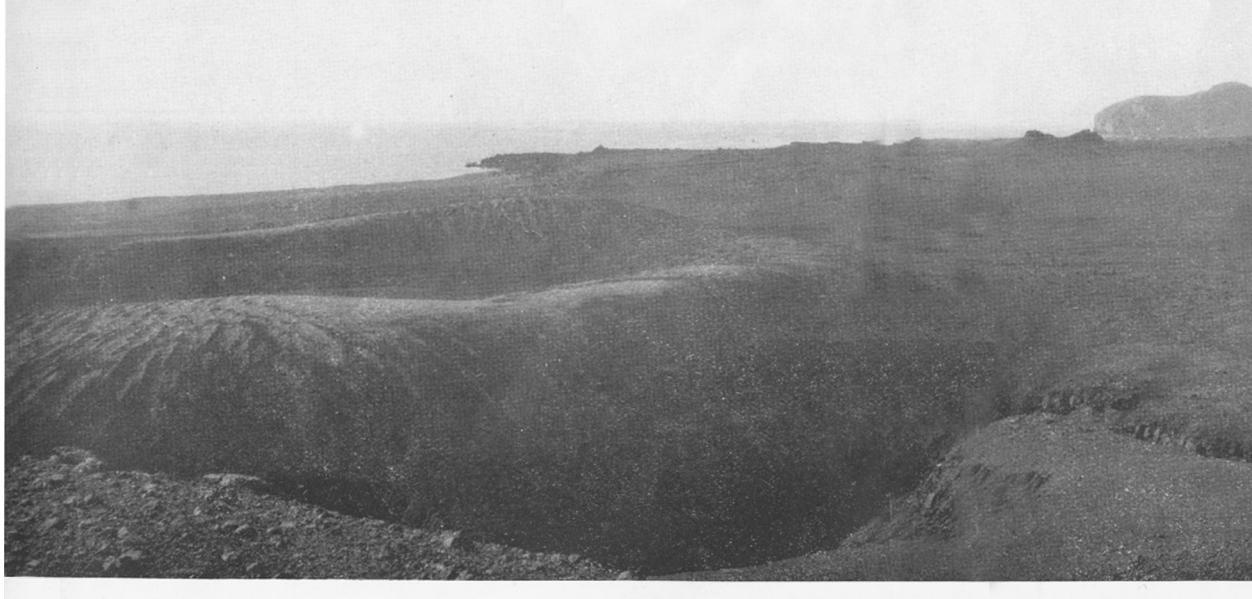
One of the early captains has described the most interesting of the known events in the island's history, an eruption in 1732. It is quoted at length in a footnote in Johann Anderson's "Nachrichten von Island, Grönland, und der Strasse Davis," published at Hamburg in 1746.

Jacob Jacobsen Laab was the captain of a whaling ship lying becalmed 3 German miles south of Beerenberg when an explosive outburst took place *at the foot of the mountain*, with flames shooting out, followed by the formation of a dark cloud. The "fire" lasted one day, but nothing happened on the big mountain above. The black cloud lasted four days, perhaps longer, as a change of wind by then enabled the ship to proceed on her way: in so doing, however, her decks were covered when she was quite 15 German miles away with ashes, so that the sails became black. One has no hesitation in accepting this as a true statement; for an impostor could not have avoided making the eruption on the big mountain and introducing lava as well as ashes. It is a further confirmation that the three possible places for such an outburst are all near the foot of the mountain on the south side, namely Berna Crater, Egg Bluff, and a subsidiary crater beside Vogt (or, as it should be called, Esk) crater. I regard the latter as the likeliest locality, despite the hot steam still coming from Egg Bluff.

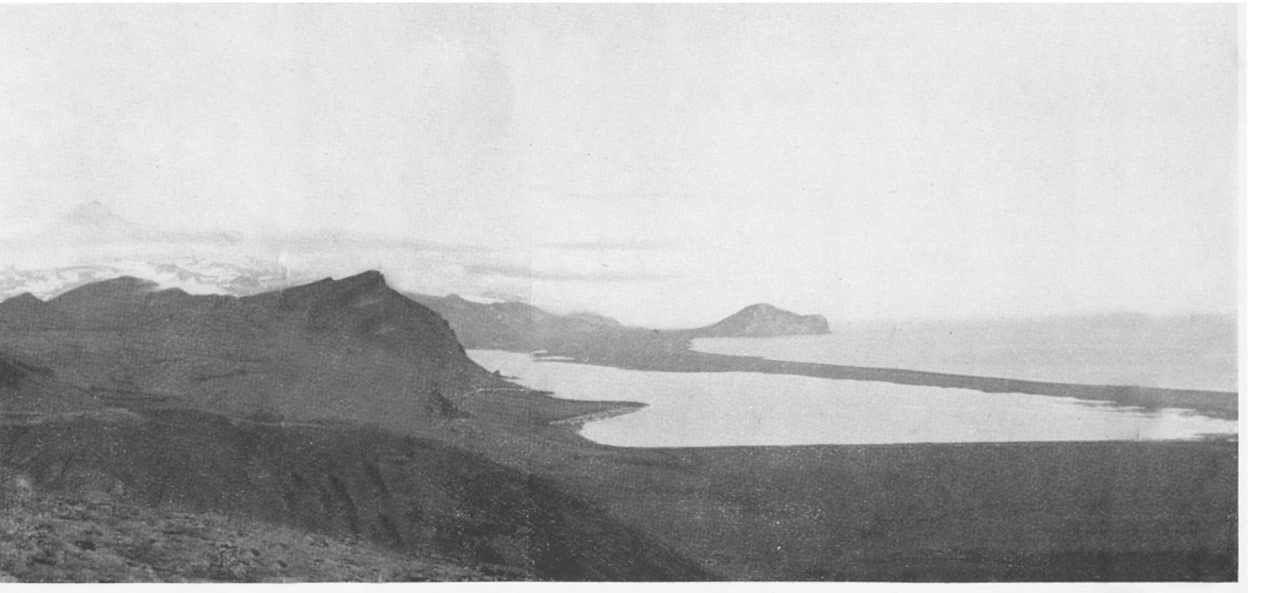
After J. J. Laab's record one is predisposed to accept the somewhat

* 'C. G. Zorgdragers Bloeyende Opkomst der Aloude en Hedendaagsche Groenlandische Visschery': door Abraham Moubach. 1720.

BEERENBERG AND SOUTH LAGOON



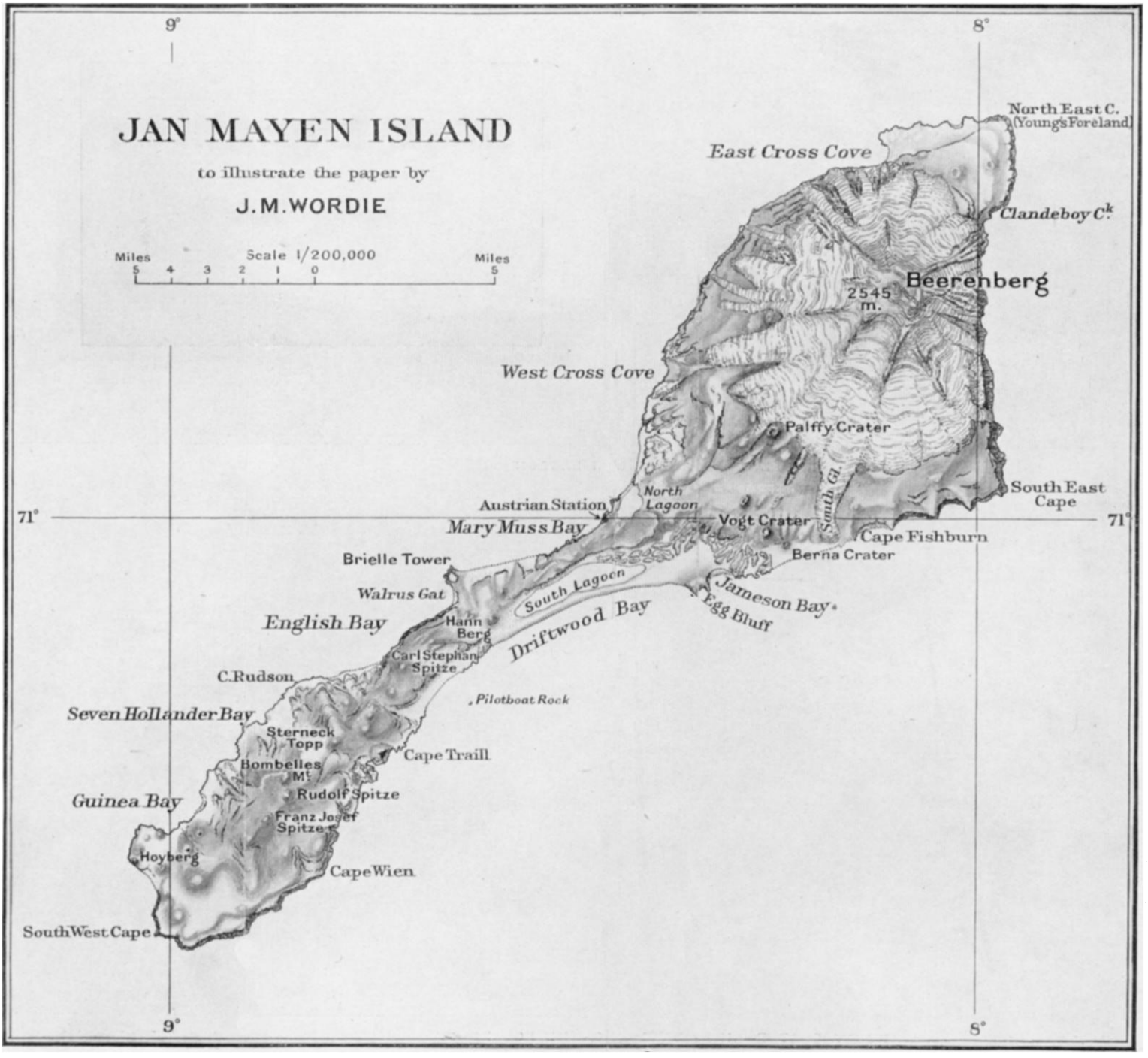
BERNA CRATER—AN ASH VOLCANO—AND EGG BLUFF



BEERENBERG AND SOUTH LAGOON

BERNA CRATER—AN ASH VOLCANO—AND EGG BLUFF

Phot. J. L. Chaworth-Musters.



tentative account by Scoresby of a possible eruption in 1818. Hot steam still rises in clouds from Egg Bluff at certain states of the atmosphere; but these would not satisfactorily account either for Scoresby's observation that the smoke was projected upwards about 4000 feet, or for the shining redness recorded the same year by a Hull skipper. Moreover, Scoresby fixes the spot as "about the north side of Egg Island, near Esk Mountain" —in the very place where I locate the ash eruption of 1732.

Scoresby himself had been ashore the previous year (1817) and visited one of the extinct craters. His description agrees well with the Vogt crater of the Austrian map: indeed, he had no time to go elsewhere; but unfortunately the Austrians following Mohn have misplaced Scoresby's name, Esk Crater. The correction will, it is hoped, be made on some future map. Scoresby's visit is detailed by him at some length, and is a record of extremely careful observation. He still leaves one in doubt, however, as to whether Egg Bluff was really an island at that time, or whether his Cape Brodrick is not Egg Bluff, and his Egg or Bird Island the rock now much reduced and called the Calf. Scoresby's map shows no South Lagoon, and the sea is represented as reaching to a feature which is obviously the "Saule." The South Lagoon was probably dry that year, as it was in 1911, so Mr. de Gisbert tells me.

The next sketch-map of the island is by Dr. Berna and Carl Vogt in 1861. In this delineation Egg Bluff is certainly not an island, and the South Lagoon appears the same as it is to-day. These facts are confirmed by some charming tinted drawings. The absence of change in the sixty years since Berna's visit makes it probable that Egg Bluff forty years earlier was pretty much as it is to-day. Vogt and Berna were ashore at the same place as Scoresby and state they climbed the same crater (Esk), now erroneously called the Vogt Crater. They also visited the interesting little ash crater since called Berna Crater. The Swede Quannersted's visit was made in 1864, but unfortunately no drawings were made to supplement Vogt's.

In 1856 the island was visited by Lord Dufferin. His description is very general, however, and his view of the mountain somewhat distorted. It compares ill with Vogt's accurate and pleasing drawings and no less lucid account. Yet "Letters from High Latitudes" has done much to make Jan Mayen familiar in this country. A similar short visit was paid to the island in 1877 by Prof. Mohn on the *Vöringen*. He was only ashore once, and was therefore not justified in altering the name of Esk Crater, which he did not visit: his outline of the coast, however, (*Peterm. Mitt.* 1878) took some days to complete, and was a distinct advance on Scoresby's.

The chart at present in use is that made by the Austrian wintering party in 1882–83. With abundant time at their disposal, they succeeded in producing a map which in those days was the best map of any polar country. We found it satisfactory in almost every respect. Their main

work was magnetic and meteorological in connection with other circumpolar stations, but they also found time to make some preliminary natural history collections. Theirs is the standard publication on the island.*

Since that date the island had never been visited for more than one or two days at a time. J. C. Wells (1872), Rabot (1892), Nathorst (1899), Otto Nordenskjöld (1900), the Duke of Orleans (1909), Charcot (1902, 1912, and 1913), the Duchess of Bedford (1911), and others, all made short and hurried visits, and have generally written accounts supplemented by useful photographs.

The 1921 Expedition.

The history of the island may perhaps have given the impression that its usefulness ceased with the collapse of the whaling industry in those parts. This is no longer the case; though lacking the mineral wealth of its great rival, Spitsbergen, Jan Mayen may yet prove useful in another field. A weather station equipped with wireless was established on the island last summer, and is likely to be permanent. As Mr. Chaworth-Musters' party obtained passages on the two small ships carrying the material of the station, he and his party had every opportunity at first hand of realizing the importance of this new venture.

Mr. Musters formed the idea of visiting the island early in January 1921, and was considering chartering a small vessel. In March he heard, however, of Engineer Ekerold's plan to establish a wireless station: co-operation was at once suggested, and a satisfactory arrangement soon reached. The party to whom Engineer Ekerold gave passages consisted of J. L. Chaworth-Musters as botanist, W. S. Bristowe and T. C. Lethbridge as naturalists, and the writer as geologist: Richmond Brown undertook the duties of "campman." With one exception we were all members of Cambridge University.

The objects of the 1921 expedition were to climb Beerenberg, often reported as being a still active volcano, and to make natural history collections supplementary to the preliminary ones made in 1882–1883 by the Austrian party. Whilst waiting at Bergen for Ekerold to complete his cargo we were met by Prof. Mercanton of Lausanne, who had long wanted to climb the mountain, and had come hoping to be able to join our party. We were thus unexpectedly reinforced by an experienced climber, who was also prepared to undertake glaciological studies in a unique field.

Inevitable but somewhat exasperating delays prevented the expedition from leaving Norway till August 1. Stiff but generally favourable winds ultimately brought the two ships (*Isfuglen*, 54 tons, and *Polarfront*, 24 tons) to Jan Mayen in five and a half days. The number of possible sites for the wireless station was limited, and Ekerold soon made his selection.

* One serious error on the Austrian map is the placing of Baren Gat south instead of north of Cape Traill.

Though not the most agreeable part of the island nor a good camp site, it nevertheless made a good central base; the next day saw our tents pitched at Jameson Bay, not far from where the wireless plant has since been erected.

The work of exploring the island was begun forthwith. We had already lost the first half of the short Arctic summer season; it was much too late to think of studying the nesting habits of the birds, and it was almost too late even to gather plants in the flowering state. Musters and Bristowe must therefore start collecting at once. They made a few short trips round the base, and then removed their quarters to a small tent 8 miles farther down the coast at the far end of the South Lagoon. From here they visited among other places Seven Hollander Bay, where a cross now stands in memory of the seven Dutchmen who wintered here in 1633, and died of scurvy in April or May the next year. Musters very soon began to find plants not previously recorded on the island. Since returning he has completed his identifications, and finds that of forty-three flowering plants five are new to the Jan Mayen flora. Whilst Musters was botanizing, Bristowe sought out and collected the insect life, more particularly spiders, the family on which he had been specializing.

So late was the date of our arrival that the snow was melted practically everywhere below 2000 feet above sea-level. The geological work could have been commenced straight away. On the other hand, the sun was already below the horizon at midnight, and it was essential to undertake the ascent of Beerenberg at once.

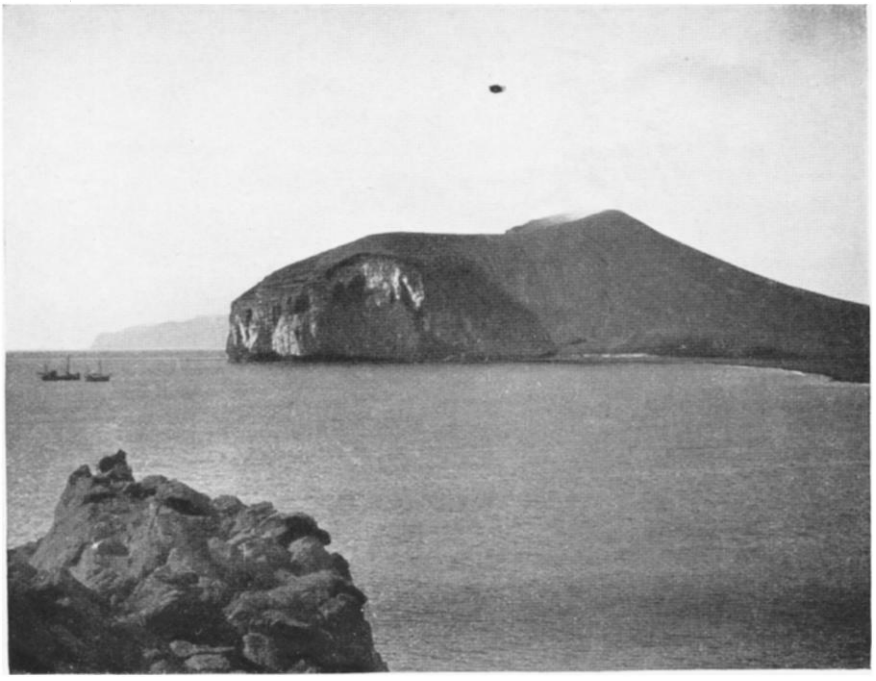
On August 9 the site of an advance camp was selected on the uppermost of the frontal moraines, 2770 feet above sea-level, and most of the necessary gear was taken up that day. The way thither led up a wide dry valley, between the so-called Esk and Vogt craters of the Austrian map. We always spoke of this as Ekerold Valley, to mark our appreciation of the latter's achievement in establishing a wireless station in this remote region. The valley is wide, but practically barren of all vegetation, owing probably to the scarcity of water, any precipitation being soon drained away through the porous volcanic sand. In normal years there may be more running water; indeed, the accounts of the cloud-covered nature of the island would seem to demand it. Last summer, however, very little rain fell during the month of August. Occasionally the hills, particularly at the south end of the island, were clouded over, but never for an extended period. The lower part of Ekerold Valley was found to be strewn with volcanic bombs of every conceivable shape; these came apparently from a small vent on the west side of Vogt (*i.e.* Scoresby's Esk) Crater, and it is here that I imagine the eruptions of 1732 and 1818 took place. Ekerold Valley is filled farther up by viscous lava; and still higher, about 2000 feet altitude, the stream cuts through an old and much-eroded crater. Quitting the valley at its top end we began to cross a series of frontal

moraines, and in so doing passed above and about 2 miles to the east of Palffy Crater, the small cinder-vent visited and named by the Austrians. The tent was pitched on the highest of the frontal moraines.

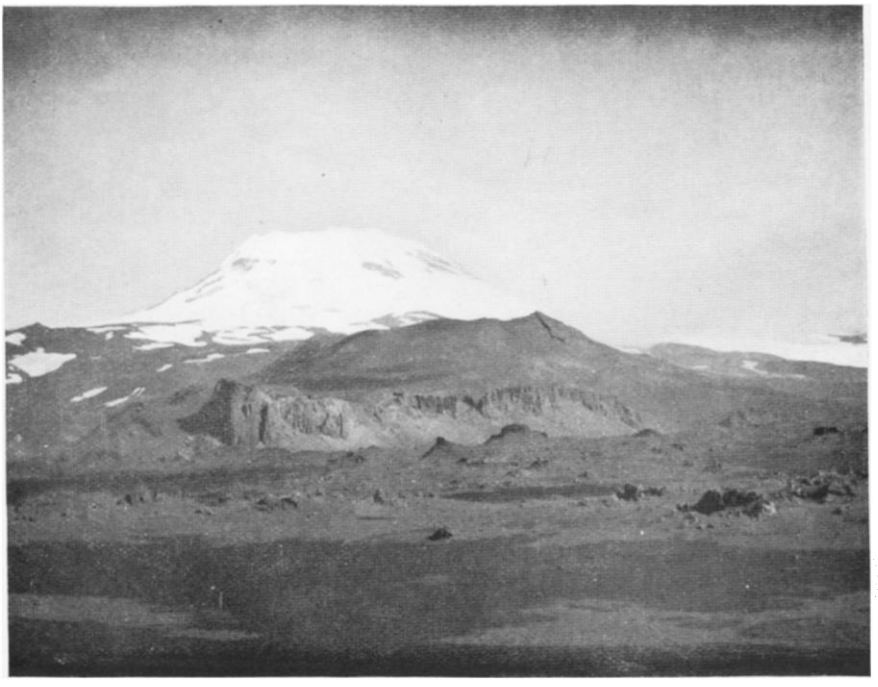
The climbing party—Mercanton, Lethbridge, and myself—went up to spend the night at the tent on August 10. Some rain fell early next morning and considerably delayed the start, so that it was nearly 11 a.m. before we finally commenced the ascent. For nearly 3000 feet we toiled up a gentle uncrevassed slope to a prominent nunatak whose height by aneroid was about 5600 feet above sea-level. The grade up to this point cannot have been much more than 8° (or 1 in 7). The snow-covered ice-slope which we had been traversing had all the appearance of an ice-carapace, such as the Hardanger Jökul. This may be so, and may point to the area being the region of most precipitation. On the other hand, Vesuvius shows a similar area of gentle inclination below the steeper final portion; and so also does Mt. Erebus. This conformation seems, therefore, most simply and probably explained as a result of the thinning out of lava-flows away from their source.

At the nunatak where we were now resting it was something of a surprise to find a small cairn, and we naturally thought this was the highest point reached by the Austrians in 1882 on the only other known attempt made to climb the mountain. It appears, however, to have been merely a mark used by them in the course of their survey; for the Austrian account points to their having tried to ascend by the buttress north of our route. From where we stood on "Austrian Nunatak" we at once realized that a successful ascent was likely. A prominent buttress juts south-west from a subsidiary top about 150 yards south of the summit proper: we might have gained that buttress and followed it to the top by a snow ridge of fairly easy aspect: on the other hand the ridge might be iced, and in any case would be more exposed to the wind than the depression on its southern side. The latter route was that finally selected.

I had asked Mercanton to be leader some time previously: the climb proper now commenced in the order: Mercanton, Lethbridge, Wordie. The way at first led through a moderately crevassed area, but at this height above the snow-line the snow bridges could be relied on as thoroughly sound. No real difficulty was experienced, therefore, until at 7200 feet a broad crevasse had to be jumped—one of those awkward uphill jumps in snow so soft as to give the very poorest of take-offs. About 400 feet higher the bergschrund was reached, and here some delay occurred, until Mercanton finally won across by clever step-cutting up a short vertical ice-wall. A climb up 150 feet of steep snow then took us to the ridge, which was but a part of the rim of the great ice-filled crater which gives the mountain its exceptional character. We estimated the diameter of the crater to be half a mile, and its depth 500 to 800 feet. At its northern side it has been breached by one of the later eruptions, and through the gap thus formed the Weyprecht Glacier escapes in a series of wonderful



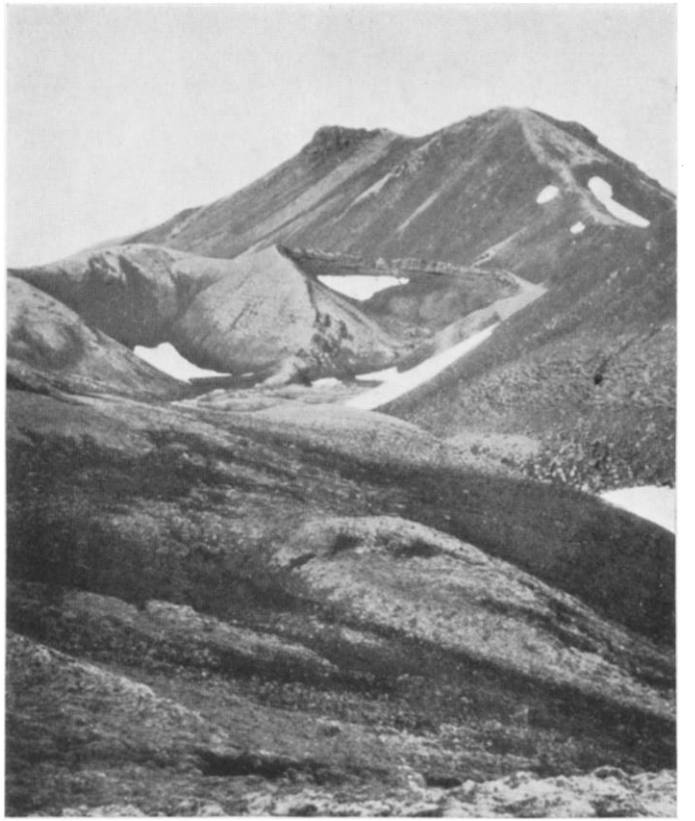
EGG BLUFF, JAMESON BAY



BEERENBERG FROM EKEROLD WIRELESS STATION

Phot. J. L. Chaworth-Musters.

BOMBELLES MOUNTAIN



LAVA CRATER NEAR ENGLISH BAY

Phot. W. S. Bristowe.

ice-falls down to the coast 7500 feet below. The highest point of the mountain, where we were soon to stand, forms the western pillar of this gateway. The maze of crevasses down in the crater bowl, the almost unbroken bergschrund which ringed it round, and the very suddenness with which we came upon it made a thrilling impression at the time. After a short halt on the ridge, we proceeded to the summit along an interesting snow arête about 300 yards in length.

We made a stay of nearly two hours at the highest point, remaining longer than was necessary in the hope that it might clear sufficiently to allow of first-class photographs being secured. Those that we took by the light of a mist-obscured sun hardly do justice to the scene. I had been making aneroid readings whenever halts were made. These were compared later with a barograph record at sea-level, and when finally corrected give Beerenberg a height of 8090 feet. The Austrian figure obtained by theodolite measurement was 8350 feet. I am inclined to trust my own figure despite the many objections that can be urged against an aneroid, because I have since found that the Austrians worked with a very narrow triangle, and definitely state that their figures are open to question.

It had taken eight hours to reach the summit, but the return to the advance camp was made in less than half that time. The greater part of this difference is accounted for by the reconnoitring which was necessary on the outward journey, the remainder to the first-rate condition in which we found the snow on our return. In high latitudes the snow, as far as my experience goes, can always be relied on; iced slopes are only found close up to rocks. We should therefore have been quite safe in climbing by way of the south-west buttress: it probably offers the quickest if not the most interesting way to the summit.

We left most of the climbing equipment at the Advance Camp before returning to the Base Camp. We did so, fully expecting to be able to make a second ascent. The attempt was too long delayed, however, and when we did return to the high camp on August 29 it was to find the tent blown down and filled with ice. The climb might still have been made, but during the night a blizzard got up which effectively stopped progress, and we were forced to return. It is certainly desirable that the mountain should be climbed a second time and a complete traverse made of the crater rim.

Soon after returning from Beerenberg Lethbridge and the writer relieved Bristowe and Musters at the South Camp. We now proved at first hand that this is both the wetter and cloudier end of the island. This did not prevent us, however, from making a detailed survey of most of the ground, and on one occasion we had the good fortune to rise through the clouds and remain above them on the hilltops throughout the day—a day made memorable by the wonderful aspect of Beerenberg

20 miles away to the north-east. Without undue exertion we carried out our programme at the south end and climbed most of the hills there. When it was finished we joined Mercanton at his glaciological studies by the South Glacier. The only parts of the island unvisited by some member or other of the expedition before we left on September 3 were the coast between Guinea Bay and Cape Wien, and the north-west, north, and eastern sides of Beerenberg; Mercanton, however, sailed round the latter region and secured photographs which at least give us a full knowledge of the lie of the glaciers in that part. Glaciers, it may be stated, are confined to Beerenberg.

The part which the Cambridge party got to know best is of course the region within a 5-mile radius of Jameson Bay. This is the more exposed side of the island: no matter what the weather may be, there is always a swell running in from the open sea. It appears quite possible that changes have taken place in historic times on the coast-line between Cape Traill and Cape Fishburn. The doubtful accuracy of the detail of the older sketch-maps, however, prevents any great reliance being placed on comparisons with past data.

In this region the leading feature is Egg Bluff itself, corresponding either to Scoresby's Cape Brodrick or to his Egg or Bird Island. It is a fragment of an ash crater of considerable size, but despite its being the only place where hot steam now issues from cracks, it is not on that account the very youngest volcanic episode. It is probably of much the same date as Beerenberg, and though now considerably eroded is quite sufficiently resistant to hold its own more or less against the attacks from the sea. On Vogt's drawings of sixty years ago it has the same shape and appearance as it has to-day. Forty years previous to Vogt's visit, however, Scoresby speaks of an island here—Bird Island lying off Cape Brodrick. Egg Bluff is probably Cape Brodrick; and Bird or Egg Island is probably represented to-day by the Calf; on the latter, though it is much reduced in size now compared with what it was in Scoresby's time, birds still nest in some number. I think this is a more likely explanation than that Egg Bluff was Bird Island itself, and is now joined to the mainland by the formation of a wide beach: the latter theory would seem to demand a much longer time-interval.

Stretching south from Egg Bluff to Cape Traill is an 8-mile-long beach, half a mile in breadth and thickly strewn with driftwood. South Lagoon is merely a shallow depression on its surface, and may at times dry up altogether. In the other direction from Egg Bluff there is a short sandy beach, then some cliffs, and then a mile-long beach with an intermittent lagoon similar to South Lagoon; then come the moraines of the South Glacier, and finally Cape Fishburn. The coast between Cape Traill and Cape Fishburn is, geologically speaking, of recent origin. It owes its beginnings to two fairly young lava-flows which had their source not far from Vogt Crater. These spread over a wide area, and together

with Egg Bluff Crater, formed about the same time, must have been an anomalous feature in the coast-line, which the sea has now brought into equilibrium by the formation of the long sand beaches. These considerable beach flats now compensate in some measure for the destruction of the great volcano on the site of the South Lagoon. I consider their formation took place long before Scoresby's visit.

The geological interest of the island mainly turns on the question of its age. We sought to determine the date at which the island was first formed, and if it was long since Beerenberg ceased to be an active volcano; on neither of these questions can one make a final statement. Partial answers, however, are furnished by the south end to the first question and by the north end to the second.

Near Franz Josef Spitze and Rudolf Spitze are found trachytes, no longer fresh as would be expected in the case of a recent eruption, but considerably decayed and perished. The mountains are carved into forms which bear slight relation to the structure, and are on the whole moderately subdued. Associated with the trachytes, and presumably post-dating them, is a conglomerate with sand-polished pebbles. Here was a chance to hunt for possible plant beds, but our efforts were fruitless. The sand-polished pebbles in any case indicated conditions inimicable to plant-life, perhaps owing to the abundance of volcanic sand lying at the mercy of the uncontrolled Arctic winds—conditions quite comparable to those prevailing to-day. The absence of any glacial deposits interbedded with the lavas, or of mountain features due to glaciation, is significant, and makes one think the island is very recent indeed. It would have been preferable of course to have been able to assign a definite date to these earliest eruptions, Tertiary or Quaternary as the case may be, but at any rate it is satisfactory to know that this end of the island is so much older relatively than Beerenberg. The presence of trachytes in the early stages of a volcanic period is in keeping with what is found in other parts of the world. The conglomerate is the proof of a pause in volcanicity, and the physiography of the southern mountain group points to a still longer pause following the formation of that conglomerate.

The base from which these early events can best be studied is Seven Hollander Bay. Between that place and the foot of Beerenberg the island is now at its narrowest, averaging less than 2 miles in breadth for a distance of about 8 miles. This however was not always the case, as is proved by the record of events found in the neighbourhood of the "Saule," the fantastic pillar rock on the edge of the South Lagoon. We studied this part from the base camp at Jameson Bay, but a more convenient centre would be Walrus Gat. The South Lagoon was found to be the site of a large crater, of which only the one side now remains and forms the imposing 800-feet-high rock walls along the north-west side of the lagoon. The lower part of the cliff consists of volcanic ashes and

lava-flows, the upper part mainly of lava-flows, into which occasional basalt sills have been intruded. Standing out in front of the rock wall is the high pillar of coarse agglomerate known as the "Saule"; its coarseness indicates that we are here standing very close to the centre of the crater. The sea, however, has removed the greater part of this old volcano, which in size may well have rivalled Beerenberg itself.

Beerenberg, though not the latest, is certainly among the last events in the volcanic episode. The focus of maximum activity had apparently shifted northwestwards step by step. This is a point that should not be stressed too much, however, in view of the following facts. Among the volcanic ashes forming Egg Bluff, for instance, are blocks of trachyte, rhyolite, and conglomerate, showing that in the north part of the island a similar set of events took place to what went on in the south. Secondly, at the stage which saw the formation of Beerenberg and its parasitic craters there was a corresponding outburst of activity at the south end, forming a few short-lived vents, whose issuing lava-flows dammed some of the main valleys, with consequent formation of temporary lakes. These latest lavas are all of the same type—olivine basalt with large well-formed crystals of augite and olivine. Tuffs may have played a part early in the history of Beerenberg—they form some picturesque cliffs round its periphery—but on the crater itself there is nothing but basalt lava. The parasitic cones, however, are not exclusively lava centres: three of them, Berna Crater, Egg Bluff, and an opening on the west side of Vogt (Scoresby's Esk) Crater are of fragmental origin. Egg Bluff is now much eroded by the sea, but though steam still issues from some cracks on its summit, it is not, I think, the very last scene of an eruption. That probably was beside the Vogt Crater—a conclusion we arrived at on the island, and which is now confirmed by reading Scoresby's account in 1818 and Laab's description of the eruption of 1732. These two events would afford a ready explanation for the large number of bombs found in Ekerold Valley on the west side of Vogt Crater.

Though unable to give a date for the commencement of volcanicity beyond surmising that it is Quaternary, one can at least date the final phases. A subsidiary ash vent was active a century ago. Lava eruptions, however, are not recorded, and probably ceased previous to the Dutch discovery in 1614. Since the island was first found, it has shown no more than waning efforts—an ash eruption, some earthquake shocks, and emission of hot steam from cracks. Beerenberg has certainly never been active in historic times.

On the somewhat unfertile soil produced from partially decomposed lava a scanty vegetation has now established itself. The prevalent strong winds and the large amount of loose sand do not give the plants much chance to flourish, however. This is certainly so on the south-east coast. The north-west side is slightly more fertile. Despite the disappointing

nature of the field Musters succeeded in getting results of value. So did Bristowe, especially with the insects. Seventy per cent. of his specimens are new records for the island. The bird-life, on the other hand, proved disappointing; like Robert Fotherby in 1615, we could well say that there was " very small store of Fowle."

In the way of economic minerals the island, so far as we have investigated it, has nothing to offer. There is a possibility, however, that the abundant driftwood, cast up by the sea to atone for the poverty of the island, may have a commercial value. Individual pieces of timber are certainly good, but, in the present writer's opinion, to gather it in bulk and ship it to Iceland would hardly be a paying proposition. Besides driftwood there are also found on the beaches numerous glass floats used by Norwegian fishermen to buoy their nets, copper floats of about 8 inches diameter used in a similar way for submarine nets, and the wrecks of at least three ships. All this jetsam has come by one route—north to Spitsbergen, westwards towards Greenland, and then south again on the skirts of the Greenland current—the counter-clockwise motion of the Norwegian sea.

The island therefore is unremunerative commercially. Norwegians, however, have realized its importance in another field. Their country is peculiarly dependent on coastwise shipping, and in the past this has suffered very heavily from unexpected northerly and north-westerly gales. The worst gales, moreover, come from a " blind corner " from which no weather reports are available. Jan Mayen fills that spot, and its importance has just been recognized by Norwegian meteorologists. Professor Bjerknes' knowledge of the scientific and practical possibilities of a wireless station on Jan Mayen had to be supplemented, however, by Engineer Ekerold's enthusiasm and energy before the present station was set going. Ekerold put forward his plans in February, and after an interval of months was finally able to get a grant of about £2000 from the Storthing. After that the affair appeared simple. In reality it was the reverse. To stow the long tree-trunks destined to be wireless masts in the two small ships was in itself a problem not easy to solve. Both ships left Aalesund heavily overburdened with deck cargoes. The next difficulty was to land the gear in the heavy surf. This difficulty too was overcome and the heavy material carried to the chosen site—a small plateau of volcanic sand, but frozen firm as iron at a depth of 2 feet. Work started on August 8; on September 17 the erecting party was able to leave for Norway in the *Isfuglen,* the engine at the station by then being already in running order and both masts (150 feet high) erected. It was possible to speak Norway with a single mast; with both it was a very simple proposition. Weather reports began at once, and continued till September 24. On that day, however, a fierce gale raged all up and down the Norwegian coast; no further wireless messages came through, for in Jan Mayen, owing to faulty couplings, both masts collapsed in the gale. On

October 19, however, Ekerold spoke Norway once more; he and his four companions had succeeded in putting up shorter masts from the remains of the collapsed originals. The station therefore is now at last in running order, and messages are being received daily, sometimes even in this country. It remains for the Norwegian weather bureau to gather and profit by the fruits of Ekerold's painstaking efforts.

Before the paper the PRESIDENT said: Mr. Wordie is well known to you, and you will remember he was with Shackleton on the expedition in which he encountered such great difficulties. Mr. Wordie was several times in Spitsbergen, and he has this summer returned again from the Arctic regions.

Mr. Wordie then read the paper printed above, and a discussion followed.

H.E. the NORWEGIAN MINISTER: I have to express, on behalf of everybody present, our gratitude and thanks to the lecturer for a most interesting lecture. What struck me as a Norwegian was the description of the bareness of this island. In my own country at about the same latitude we have thousands of people living in towns or in the country, and living rather comfortably. Jan Mayen is exposed to the Greenland current, which brings down the pack-ice, whilst Norway has the advantage of the Gulf Stream, which brings life and living conditions to a latitude in which it is not experienced in any other country in the world.

Mr. CHAWORTH-MUSTERS: Mr. Wordie has said that I disagree with him over what he has said concerning the luxuriance of the vegetation. I do not think he has seen two places which I consider to be the "centres" of the flora of Jan Mayen. These two "centres" are a sheltered valley behind Cape Fishburn and a little strip of lowlying land along the north-west coast of the south end. From these centres the flora of Jan Mayen seemed to have originated, some plants occurring at one spot, and others spreading in different radii around them. At Cape Fishburn these species occurred only in the sheltered valley; two species occurred as far as the South Glacier, whilst five species had reached as far as the Willberg and the North Lagoon. This fact seems to point to the conclusion that some plants have migrated to Jan Mayen within very recent times, perhaps as recent as fifty or a hundred years. The isolation and volcanic character of Jan Mayen make the origin of the flora exceedingly interesting. As Mr. Wordie tells me that the island has never been in connection with the mainland, the plants cannot have migrated over land now submerged beneath the sea. The plants must have been transported there by wind, sea currents, or by the agency of animals or birds. There were only two wind-distributed plants on the island; these were a Taraxacum and a Salix; although I believe some of the species with very small seeds are sometimes distributed in this manner. That seeds should be carried far by sea currents is, I think, highly improbable, except in the case of large seeds with waterproof coverings. However, they might be carried in cracks in the driftwood, but I think that they would be knocked out when the wood was smashed by the ice. The most probable means of transport is on the feet of wading birds which stop at Jan Mayen on their way to and from their breeding grounds in Greenland and their winter resorts in the south. The total lack of berry-bearing plants points to the fact that the seeds are not carried by seed-eating birds. The driftwood and other objects washed up by the sea are very interesting. The driftwood comes from the great rivers of