

3. Ordinary Fellows—

Ordinary Fellows at November 1874,	345
<i>New Fellows</i> , 1874-75.—John Aitken, Esq.; The Hon. James Bain; Dr Ludwick Bernstein; James Bryce, LL.D.; John Christie, Esq.; Robert Clark, Esq.; Dr T. S. Clouston; Dr William Craig; Daniel G. E. Eliot, Esq.; Thomas Fairley, Esq.; Robert Gray, Esq.; Sir John Hawkshaw; William Jack, Esq.; Archibald Kirkwood, LL.D.; John Ramsay L'Amy, Esq.; C. H. Millar, Esq.; John Milroy, Esq.; E. W. Prevost, Esq.; Ralph Richardson, Esq.; Michael Scott, Esq.; James Syme, Esq.; James Thomson, LL.D.; Charles Wilson Vincent, Esq.; Professor Daniel Wilson,	24
B. Baden Powell, formerly elected, but not admitted till 1874; Dr Alexander Wood (re-admitted),	2
Total New Fellows,	26
	371
<i>Deduct Deceased</i> .—Rev. Dr Aitken; John Auld, Esq.; Dr J. Hughes Bennet; Rev. Dr Crawford; Col. Seton Guthrie; Sir William Jardine, Bart.; Professor Macdonald; Hon. Lord Mackenzie; E. Meldrum, Esq.; Ven. Archdeacon Sinclair,	10
<i>Resigned</i> .—Rev. Thomas M. Lindsay; John L. Douglas Stewart, Esq.,	2
<i>Cancelled</i> .—Charles Lawson, Esq.,	1
	13
Total number of Ordinary Fellows at November 1874,	358
Add Honorary and Non-Resident Fellows,	50
	408
Total Ordinary and Honorary Fellows at commencement of Session 1875 (6th December),	408

The following Communication was read:—

The Volcanic Eruptions of Iceland in 1874 and 1875. By Captain Burton. (With two Maps of Iceland).

Shortly after reading "Volcanic Eruptions in Iceland" (the "Scotsman," May 21), and "An Appeal for Iceland" (the "Times" July 1), I made a trip to Arctis, partly with a view of inspecting and inquiring into the last outbreaks. Perhaps your energetic Society may not be unwilling to have an unprejudiced account of what was seen and heard.

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Eliot,
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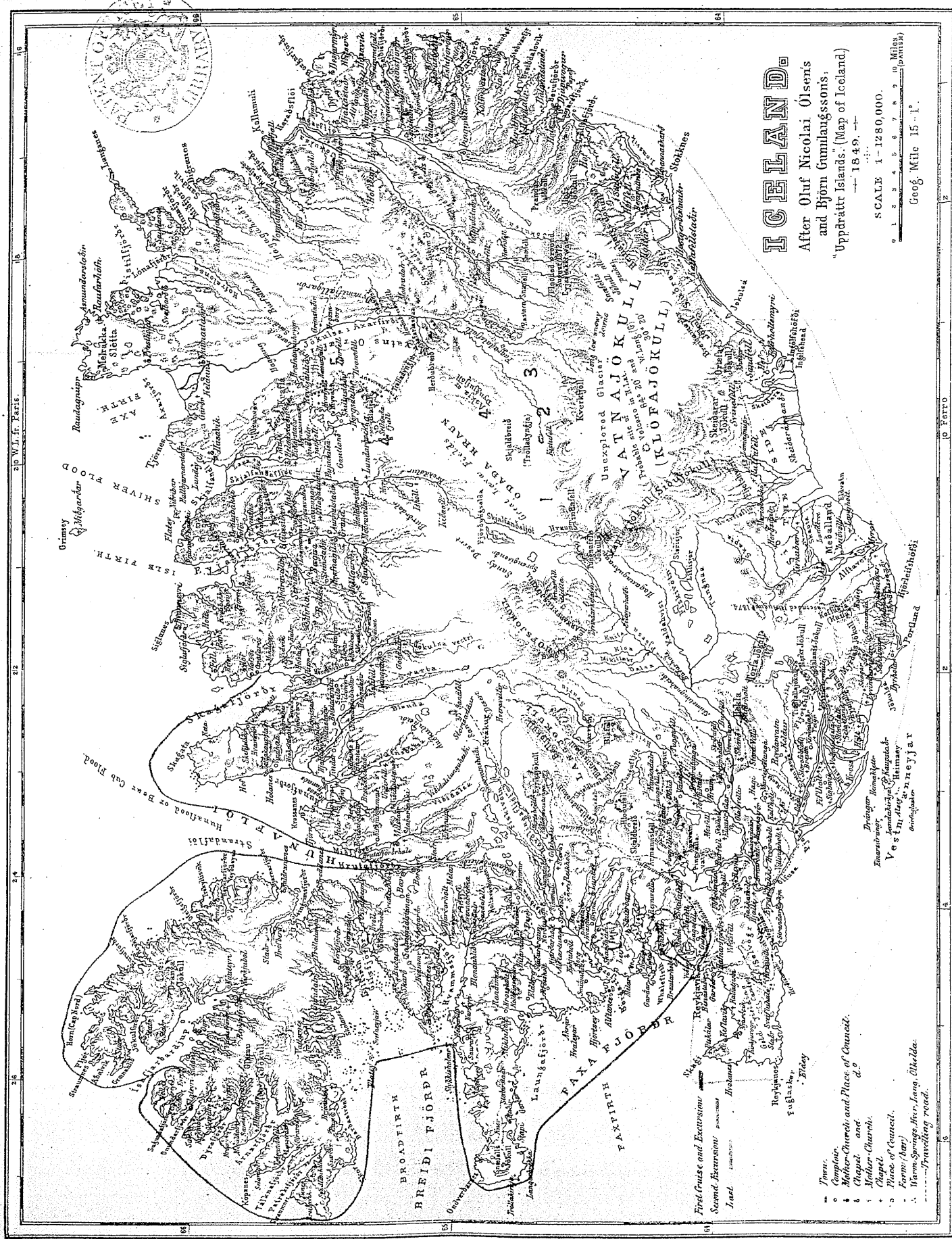
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ICELAND.
After Oluf Nicolai Ósenis
and Björn Gumlaugsson's;
"Uppdráttir Íslands." (Map of Iceland)

1849.
SCALE 1-1280,000.
0 1 2 3 4 5 6 7 8 9 10 Miles
0 1 2 3 4 5 6 7 8 9 10 Geog. Mile 15 1/2

No. 1, 2, 3. Eruptions with intermissions during the years 1867, 1869, 1870-72. No. 4. Eruption about Christmas 1874. No. 5. Eruption 29th March 1875. The brown shading mark the Ashes thrown S. E. to East.

1875.
1874.
1873.
1872.
1871.
1870.
1869.
1867.

The accompanying maps, prepared for my forthcoming volume, ("Ultima Thule"), mark the four paroxysmal eruptions which took place upon the same area during 1867, 1869, 1870 (to 1872, at which last date all activity had subsided), and about Christmas 1874. Number five, the latest phenomenon, broke out on March 29, 1875.

These movements may or may not be connected with the five days' eruption of Skaptár Jökull (January 9, 1873), recorded by all the journals of Europe; but they certainly occupy the heart and the southern outskirts of the Odáða Hraun, the great lava field subtending the north of the Vatna Jökull, and extending to the N.N.E., almost as far as the Lake Region—Mý-vatn and its oasis. The name is variously translated "Terrible wilderness" (Henderson), and "Desert of the Evil Deed" (Baring Gould), whilst the area is differently calculated at 1160 to 1500 square miles; in fact, one half of the Vatna Jökull. Viewed from the nearest heights—Bláfjall, for instance—it is a grim and ghastly picture, a region of ruin and desolation, a fitting *mise en scène* for the Last Man: my companions remarked that such a spectacle would soon give them the horrors. I see no difficulty beyond a certain expense in crossing and exploring this waste: at the same time, I doubt that the feat would yield any results; and exploration purely for exploring appears to me like "climbing for climb."

This "great and terrible wilderness," so small and mean in comparison with the Sahrás of Africa, Asia, and South America, and yet so grisly in its brown-black desolation, is supposed by Baring Gould to be the gift of the Trölladýngjur and of Herðubreið, while Mr W. L. Watts would derive it solely from Skjaldbreið. I find it to be the produce of a multitude of craters which opened in and south of it, before the days when Örafi and other lofty peaks, attracting rain and snow, built up the mighty *névé*, which monopolises the south-eastern corner of Iceland. The peculiarity of the latest outbreaks (1867-1875) is the distance, not to say isolation, of the vents from any large body of water, suggesting the unpleasant fact that we must modify received opinion. For instance, the eruption of Christmas 1874 upon the south-eastern flank of the distorted horseshoe Askja (oval-shaped wooden casket) or Dyng-

jufjöll (Cubilia or "Chamber Hills"), are at least thirty-eight direct geographical miles from Mývatn (midge-water), and forty-five from the nearest seashore. Nos. 1, 2, and 3 vents are more distant from the lake, and but little nearer the coast. The non-maritime Andine volcanoes are popularly supposed to be connected by fissures and strata-faults with the Pacific. Here, however, the foci are separated from the Atlantic eastward by the valley of the broad and deep Jökulsá í Axarfirði, the longest, if not the largest, river in Iceland. To the west they are guarded by the Skjálfandi Fljót, and south by the huge Vatnajökull, whilst palagonite is not a rock which maintains permanent fissures like porphyry. I can only suggest that the eternal snows of the mighty névé take the place of lake and sea water.

Our approach to Iceland was heralded by volcanic phenomena. On Friday, July 8, as my shipmates were recovering from the sufferings which began in Pentland Firth, we found the milky blue sea patched and streaked with what many supposed to be rye—the cargo of some wrecked vessel—but which proved to be pumice, the largest piece hardly equalling a bean. On the return voyage (August 9) we passed through a similar discharge, and we heard of dense and choking ash-showers. Landing (July 10) at Húsavík, the old export harbour of the great Northern Brimstone Mines, we found burned stone thrown up in tons on the beach north-east and south-west of the factory. A few of the bits were equal to a man's fist: some were slightly vitreous, and others had a fibrous texture like asbestos; they much resembled those brought from the Askja by Mr W. L. Watts. Lastly, when we approached the focus of eruption we picked up common specimens of an intermediate size, where certainly none existed in 1872. Our maximum distance then was 70 or 80 miles, and the line of our direction was from south-west and west to north-east and east. As will presently appear, a single morning (March 19) is supposed to have discharged 3840 tons in four hours. All authorities are agreed that the ashes fell in Norway within twenty-four hours—a rapid but not an unusual rate of progress. In the Hekla eruption of 1693 the scorix were also carried by the winds in one day to the Færoe Islands; the same was the case with the Skaptár outbreak of 1783; and in 1845 the goodwives of Shetland, when bleaching

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of Edinburgh, Session 1875-76.

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their linen, were surprised to find it covered with pepper from Hekla. But instances of this nature need not be multiplied.

On July 17, while collecting specimens of brimstone from the great Mý-vatn mines, a select company of the expedition rode over the Námaskarð ("Fountain-scaur"), the gap in the *Montes Phlegraei*, east of Mý-vatn, and thence we took the highroad, or rather the bridle-path, leading eastwards over the Mý-vatnsöröfi (Desert of the Midge-water) to the greatest of the three Jökulsárs. After some three hours of sharp canter, which covered more than half-way, we sighted to the south of the road and north-east of Búrfell, a low black-blue mound with white patches. It was about a mile long; and a solitary puff, escaping every quarter of an hour, told us that it was burning low. Nothing could be meaner than this outbreak, which I will call the Mý-vatn eruption: it looked by the side of older formations as if Vulcan had struck work, and the underground furnace of Iceland were being "drawn." Shortly after our departure, however, Mr W. L. Watts here observed a huge Gjá, and an active eruption, which he briefly noticed in the "Times" newspaper, and which I hope he will presently describe at greater length, accompanying his description with a ground-plan and elevation.

This No. 5 is connected by a band of old lava with No. 6, a mound to the north of the road. It was first seen (Feb. 18) from the Grimstðair farm, erupting to the west of the Sveinagjá, in what is called the Austurfjöll or Mý-vatnsfjöll. The great smoky fire (jarðeld) springing from 14 or 16 mound craters (gosborg) lying on a meridian, formed, say the natives, a molten river 300 to 400 fathoms broad and one *vegarleid* (= 3 English miles) long, throwing up lava, pumice (*vikur*) and stones, often the size of a man, which fell down upon the crater lips. Some of the hot material melted the snow. The lava soon set, but the ground was too hot for walking, and the stone flood glowed white beneath 2 to 4 feet of the upper black stratum which had cooled in a few minutes. The plain around was split with hideous Gjár (fissures); the frequent hornitos, blisters, and hillocks on the run, probably the effects of steam, were hollow, with a capacity of 2 to 4 hogsheads, and the smoke (vapour?) hung upon the horizon like a cloud. On March 10 the eruption lasted all night, and the most violent effort

was on April 13. By that time the area of the foci (*eldgígar*) was about 40 square fathoms; and where the ground before was level, rose a lava hill 30 to 60 feet high. The greatest flow was to the north, and southwards a fire stream (*eldgos*), one mile long and 500 fathoms broad, was covered with high and rough blisters; and was overhung with whitey-blue fumes. The view was confined by the fine dust to 300 feet: during daylight it wore the semblance of a mirage (*Landjöldu* or *Tiðbrá*), and at night it became a pillar of fire.

Our disappointment was tempered by meeting a party of three Icelanders driving two ponies, whose imitation Icelandic coffers bespoke the English owner. The head guide introduced himself as Páll Pálsson; I recognised him as the godfather of "Mount Paul" in the heart of the *Vatnajökull*. Led by Mr W. L. Watts, he and five other islanders set out from the *Núpstaðir* farm on June 24, and after twelve nights and days (July 7) in the snow, the adventurous band issued from the great *névé* between *Kistufell* and *Kverkfjöll*, and on July 10—a fortnight and more—they reached *Grimstaðir*, whither their horses had been sent round *viá* the Eastern path. This is, indeed, a unique feat of travel which I hope will not be its own reward. Paul, who was physically as well as morally the best type of an Icelanders, accompanied us to our head-quarters at *Reykjahlíð* and gave me a detailed account of the southern outbreaks. He saw south-east of the *Kistufell* and north of the *Vatnajökull*, but not in the snow, two small smokes, remnants of Nos. 1 and 2, distant some six hours' ride, and three others appeared in the *Dýngjufjöll*. This account was confirmed by Dr P. E. Julius Halldórsson, government physician of the *Thingeyjar Sýsla*. Both agreed that No. 4 was still active, and they placed the site on the south-eastern bend of the *Askja* or southern *Dýngjufjöll* the curious horseshoe of the map which they would break up into detached hills, and would moreover open to the N.E. instead of the N.N.E. The lava on April 10 was about three (Danish) miles long by a maximum of half a mile broad. At night the farm rooms were completely illuminated by the fire-blush (*Eldroði*), and when this ceased violent earthquakes came on. Showers of ashes fell north of *Mývatn* (*Thingeyjar Sýsla*), and more copiously in the *Jökulsdal* (*Múla Sýsla*), covering the ground

with a stratum a quarter of an ell thick.* The darkness during the dust showers prevented the Jökulsdælingar (people of Jökulsdal) reading by day, and many of them left their farms and drove their cattle to grass on the Vopnafjörðr. This outbreak is supposed to have come not solely from the Dýngjufjöll, which, since April 5, emitted only heavy smoke, but from several other places in the northern, the north-eastern, and the north-western faces of the Vatnajökull. In addition to this movement, which may be called the "Dýngjufjöll eruption," and which is frequently referred to in the local and in our home papers, Dr Julius places another vent, hitherto unnumbered, about seven miles to the S.S.W. of Herðubreið, the "broad-shouldered" and perpendicular-sided mountain of palagonite, which I had attempted to ascend in 1872. I am happy to say that Mr W. L. Watts also noted the projecting buttress from the south-west, which, descried too late, appeared to me the only place for successful climbing. Here was the outbreak of May 29, 1875, and hence, according to my informant, the greater part of the ashes and pumice had been carried to the north-east. On the other hand, Mr W. L. Watts saw no crater south-west of Herðubreið, and would derive the pumice and ashes from Askja. The Medico placed a supplementary crater in the old lava-field on a meridian between Herðubreiðarfell and the Reykjahlöf-Jökulsa road. Thus we have five several vents:—A and B, north and south of the road (March 29); C, continuing the line southwards; D (May 29), near Herðubreið; and E, the Askja or southern Dýngjufjöll

On July 29 the expedition received, at Húsavík, a visit from Mr W. L. Watts, who was fresh from the conquest of the Vatnajökull, and he gave us the first intelligent account of the movement. He had found fresh ashes, but no pumice, on the snows of the Vatnajökull, about the middle or in N. lat. $64^{\circ} 25'$. Kistufell was quiet; smoke or vapour issued intermittently from Kverkfjöll, which I saw in 1872 vomiting a glacier, and about Skjaldbreið rose a large mound of old lava, but no new signs of action appeared. He walked over layers of pumice, extending a score of miles, from the Svartá

* The Danish measures are:—

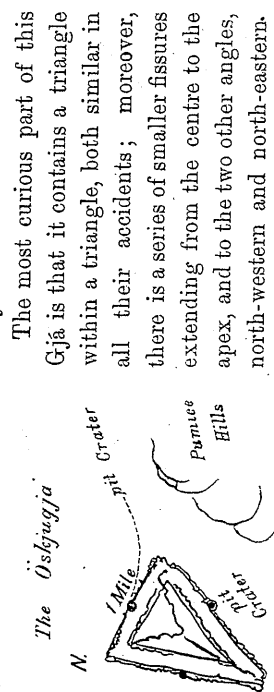
12 inches = 1 foot (= 12.356 English).

24 thumblungar or 2 feet = 1 alen (ell).

24,000 feet = 1 mile (= $4\frac{1}{2}$ English statute miles in round numbers).

to Herðubreið, the deepest drifts measuring some eight feet, being north-east of Vaðalda to five miles south of the "Broad-shouldered." The explorer's chief work was about the Askja or southern Dýngjuhöll—I must warn my readers not to confound these "Chamber hills" with the "Trölladýngja (sing.), perhaps better known as Skjaldbreið, the "Broad shield. As Mr Watts intends to publish his discoveries, I must not abuse the liberality with which he gave his information. He would break up the fanciful horseshoe of the great map, which in these parts is a mere field-sketch, into a heart-shaped series of hills, mounds, and cones, here connected, there separated, by "Gills" and broad passes: on the western side the Odáða lava has penetrated into the *enceinte*, and a latitudinal bar of heights traverses the southern quarter. By walking over the eastern hills Mr Watts came in sight of the centre of eruption; the aneroid stood at 25·05 (=5000 feet in round numbers, whilst the northern plain is about 1000 feet lower. Various angles to Herðubreið (80° to 40° for mag. var., west = 40), and the Skjaldbreið (170° to 04° = 130°) placed the Gjá-site inside the horseshoe in N. lat. 64 45' and about W. long. (f.) 17.

The centre of the eruption, which we will call the Oskjugjá, was a mere fissure, an acute-angled triangle with the apex to S.S.W.; stepping the base gave a little more than a mile, and the circumference would be about five. The three arms were deep and perpendicular crevasses opened in the hills by the eruption, and the lips readily fell in. The heights around it, especially those to the east, were strewn with thick strata of pumice, ejected wet, and decomposing under atmospheric action; they also showed that surface-streams of water had lately flowed over the new matter.



The most curious part of this Gjá is that it contains a triangle within a triangle, both similar in all their accidents; moreover, there is a series of smaller fissures extending from the centre to the apex, and to the two other angles, north-western and north-eastern. At the eastern arm, a deep pit about a quarter of a mile in circumference discharges volumes of

steam and fatty fetid loam, which falls in granules. At the base is another pit-crater, opening in high and broken ground; it is also covered with pumice and offensive loam, which the depths continue to vomit. The explorer distinctly saw a pit of hot water spouted from the western side of the inner triangle: he could trace, through the volumes of steam, its shaft or column, and he heard the rain fall upon the rocks, bringing down with it an avalanche of stone. The Askja is not a Jökull, and only a few streaks of snow lay upon the flanks. This, therefore, may be considered a crucial instance of water erupted from a fire vent.

Meanwhile there are no reports of any outbreak at Herðubreið, nor in the Trölladýngur, the inadequate features from which Baring Gould would derive the Odáða Hraun. I have taken the liberty in my map of counter-marching the "Troll's Bowers," from a meridian to a diagonal, beginning south of Bláfjall and abutting almost upon Herðubreið. In local history we read dreadful accounts of Trölladýngur's seven eruptions; of A.D. 1150 (the earliest); of 1180; of 1340, when the "Broad-shouldered" is said to have vomited for the first time; of 1359; of 1475; of 1510 (when the second outbreak of Herðubreið is reported); and, finally, of 1862, when there was an eruption of ashes, concerning which we have few and uncertain details. Thus the ratio of outbreaks from Trölladýngur was 7 to 26 Heklas, 13 Katlas, 11 submarines, and 5 Órafas.

The local papers, especially the "Norðantari" of Akreyri (February 19, March 3, April 9 and 17, and May 13 and 19; and the "Isafold," of March 27), give ample accounts of the late movements. The Mývatn eruptions have been visited by many parties of farmers, but only one has yet reached the Óskjugjá (Askja or Dýngjuhöll Gjá). The *relations* are chiefly from the pen of Jón Sigurðsson, of Gautland near Mývatn, Knight of the Dannebrog, and Athingismaður (M.P.), whom some Englishmen have lately confounded with another "White John," the celebrated agitator who lives at Copenhagen. Much of the matter has been translated and published by our home press, but there are interesting details which have not been noticed. Generally—allow me to remark—the accounts, though utterly unscientific, bear an aspect of sobriety and truthfulness wholly wanting in the older Icelandic

descriptions recorded by Mackenzie and Henderson, and they show that the spirit of enterprise has not wholly died out of Iceland. It must, however, be borne in mind that both features are mere crevasses opened by the tension of gases, and that due allowance must be made for "hills and hillocks," for "cliffs and precipices."

The "Isafold," a new paper published twice or thrice a month by Hra Björn Jónsson, and printed by Einar Thórðarson of Reykjavík, gives (No. 2, of March 27) a letter from Mývatn, which well describes the outbreak nearest the lake. It owes its chief interest to the fact that it is the only one which corroborates the testimony of Mr Watts, in mentioning torrents of hot water that cannot be melted snow. At 11 A.M., on February 16, an expedition ascended and crossed in half-an-hour the eastern flank of the volcano, which in that direction sends out a long spit. After mounting a low hill with a steep cliff to the south, the explorers reached a narrow crevasse lying on a parallel of latitude, and forming a "vinkil," apex, or angle to the south. Here they found a deep flat recess about half a (Danish) mile in diameter, surrounded by heights with perpendicular scars to the east and south; west and north-west the land was lower and flatter. Snow covered the whole country. Hard by to the south-east and on plain ground rose the crater which vomited the densest smoke, but there was no new lava except upon the lips. The stone-rain, and hot ground burning their shoes, prevented them approaching it nearer than 70 fathoms, but they computed the diameter at 40 to 50 fathoms, and the cone sides were so steep that the breadth above and below was about the same. The crater jetted in paroxysms. The thick smoke made the ejected matter appear like torn fragments of coat lining—evidently melted stone or burnt mud, most of which fell back into, or on the edges of the bowl. The smaller rapilli were thrown to a minimum height of 100 fathoms. No fire appeared in the crater. Some 80 to 90 fathoms to the west was a cliff probably formed by the eruption; it measured a tenfold area (8000 to 9000 square fathoms). The rocky edge, except to the north-west where it was lowest, stood some 6 fathoms high. Below and south of the cliff rose a second and a somewhat smaller crater. It jetted steadily, but not so high as the other: discharging a lava-rain

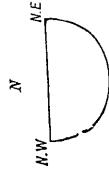
to the south-west; and a rivulet of almost transparent water flowed to the north-west, where it formed a little basin under the rocks.

The expedition did not attempt the cliff because they had no ropes, and both rocks and snow were cracked and crevassed. A little further west rose the third crater, which vomited only smoke. Its "Vinkil" or apex was a horseshoe, with the two heels to the north and the toe facing south.

It is perhaps a little higher than the level of the Mývatnssveit (the adjoining midge-lake country). If much more lava flow, it must be filled up, and then the fiery torrent will run over and along the cliff to the sandy waste on the left bank of the Jökulsá. East of the new mountain and the recess was an old Hraun or lava stream, which seemed to have discharged eastwards; the bed showed no signs of craters nor volcanic vents, but the snow will prevent till next summer any examination of the Steintegundir (minerals).

Ash showers have been blown to the north-east of the Austurfjöll and, falling on the grass, which was bare of snow, they will probably injure the pastures. It is reported that stone-rain extended to Kelduhver east of the Reykjartheiði. About New Year's day, an earthquake opened great crevasses where formerly the ground was smooth. These movements were numerous near the volcano. The expedition built a snow-house under the ravine-cliff, but the falling stones compelled them to abandon it.

The "Norðanfari" of February 19, relates that during the winter of 1874-5, a strong earthquake, proceeding from the southern or outer Dýngjufjöll (hin fremri), shook the farms of Viðdal, Grímstaðir, and Mœrdal á Fjöllum, in the latter levelling some buildings. From No. 13 of March 8, we learn that four men of Mývatn (Mývatningar) set out on Feb. 15, directly southwards, and after walking 24 hours, hearing frightful subterranean thunders (dunur) like cataracts from a mountain, and smelling sulphur fumes (eldlykt), they reached the Askja, which has been incorrectly laid down on the map. The jets of stone and lava, thrown many feet high, prevented them approaching nearer than 60 to 70 fathoms. The vents consisted of one large focus and of many small parasites, a single one discharging lava. In early February smoke appeared every day, and presently



five, in the second for three, and in the third for four hours. The layer of pumice and ashes measured some $4\frac{1}{2}$ inches deep in the Jökulsdal, and $1\frac{1}{2}$ in the Seyðisfjörð. This was the sixth explosion since the outbreak, and about every tenth or twelfth day the violence increased. The line extended through the Oðdáhraun to a little north of Reykjahlíð-Grimstaðir road.

About Easter-day a thick smoke was seen at Möðrudal á Fjöllum; it rose south of Herðubreið, and many erroneously thought that it came from Möðrudalsland. Others supposed it to rise from the Dýngjufjöll, but it was certainly from Vatnajökull, or from the Tungu (Doab or Mesopotamia), formed by the westernmost forks of the Jökulsá. The discharge of pumice (*Damizé* "Pimpsteen") was so abundant that for days the ferry boats could not cross the stream.

The "Norðanfari" of May 13 contains an unsigned article, bringing up the account of our Mývatn eruption to May 5. Loud thunderings with thick smoke were noticed on the last "Tuesday in the winter," that is, on April 13; the summer beginning with "Sumarmál," April 17. On the "first summer day" (April 22) four men took horse to visit the volcano. From Kollóttafjall they saw a fiery crevasse, made like a mountain "fjargý," or sheep fissure where the animals take refuge during bad weather; and on the borders of the Sveinagjá, where a fine grassy plain formerly extended, they found a high hill of lava pierced with three craters lying on a meridian. These vents roared loudly, and threw up rocks, which returned to the earth after 45 seconds. The smaller rapilli rising like smoke disappeared in the air, and presently fell like snow. From the largest focus, which lay south of the road, a fiery flood ran westward: it had been reported three (Danish) miles long, but it proved to be about 1000 fathoms, with a breadth of 300 to 400. The people of Mývatnssveit have lost a little grass, chiefly to the north of the road, and their ponies may suffer during the winter. Some convulsion has taken place in the Dýngjufjöll, whence, for a long time, more smoke issued than during the winter. There was a great eruption close to the Oðdáhraun on March 18 and 19, and the concussion of the air drove the farm people from their beds. On March 23 fire was reported to have proceeded from forty places lying close to the Hóisfjöll road, but it lay west, not east, of the Jökulsá.

came a slight earthquake. In April 9th, Jakob Hálfánarson, the farmer of Grimstaðir on the Mývatn, reports his visit to the Mývatnssfjöll, where, on March 10th, the eruption lasted all night; and next day the smoke, hanging for a full eiktarleugd (three hours) upon the horizon, was dispersed by a storm. He walked northwards over the lava hill (Hraunmalarkamb), and saw the molten stone in the crevasses as if a fire had been built with wood and charcoal. East of the Kamb (coombe), he inspected two big crevasses erupting large stones, which fell back into them. The lava had flowed for two days, and small fragments lay 300 fathoms distant from the fire stream: 160 fathoms to the west smaller bits were found; but the greatest quantity was heaped up within ten fathoms of the vent (eldsupptök). An anonymous account of the same eruption, supposed to be by old Pétur Jónsson of Reykjahlíð, father-in-law to Jakob Hálfánarson, is given in the "Norðanfari" of April 17, 1875. He reports that sundry Laxárdalers rode some six hours from Reykjahlíð to explore the new volcano, *vá* Hvannfell, where they heard loud thunderings. A storm raging at the time in the north-west made them mistake the cause: these rumblings became fiercer as they approached the focus. The earth-fire springing out of three places in a meridional line, formed high lava hills upon the level ground. The greatest altitudes were to the north: 50 to 80 fathoms west of the northernmost, upon a tract which had sunk more than three mannahæðir (stature of man), lay a great "gil" or crevasse. About the three foci, which owned from 20 to 30 parasites, the lava had run mostly to the south-east, but now he saw it flowing from the southernmost to the S.S.W. The northern was an elongated rise, and from its crater, about 300 fathoms in length, hot lava jetted 200 to 300 feet aloft, and fell in small cold drops upon a scanty area. No fire appeared during the day, only white mist (*gufa*), growing whiter as it rose in the air; it was so thick that it towered many fathoms high, and the direction was perpendicular, although a strong wind was blowing. In the darkness of the night conflagrations became visible. No ashes fell at Mývatn, though they were thickly spread by a strong north wind, and were strewed together with pumice over the eastern regions, especially at Jökulsdal, Fljótsdal, and Seyðisfjörð. In the first-mentioned place candles were lit for

Extracts from the letter of my friend, Sira Sigurður Gunnarsson, the priest of Hallormstað, addressed to the "Nórðanfari" of April 24, appeared in the "Times" of July 1, 1875. It is dated March 29, 1875, and headed "Fall of Pumice and Ashes in Múlasýsla." The author, I may remark, has more than once visited the Vatnajökull. The following interesting details may be added to the abstract:—"During the Yule of 1873, and in early 1874, an earthquake shook the eastern regions, after which the people of the Fjöll country saw two tall pillars of thick smoke apparently proceeding from the Askja or Dýngjufjöll; and viewed from Hallormstaðarháls they rose at a considerable distance from each other. Early in the year there was no fire in the Mý-vamsöræfi, and the earthquake became less violent towards the end of the winter."

After noticing the thunderings and the ash and pumice rain of March 29 (Easter Monday) reported in the "Times," my reverend friend continues:—"The movement appears to have taken place in the southern part of the Dýngjufjöll, westward of Herðubreið, and a short way north of the winter Gjá. The direction of the ashes was on both sides of a line to Mödrudal and Fossvellir, as far as the Unáos in Hjaltarstaðarhingá and the Vatnsdalsfjall. Another shower, travelling from west to east, and extending four (Danish) miles, fell at Brú, and a mile and a half east of Aðalbol (Brafnkelsdal), Kleif (Fjótalsdal), Skriðdal, and as far as Fáskrúðsfjörð to the south-east. The amount which fell east of that line in Breiðdal and Stöðvarfjörð was trifling. If we draw one straight line from the focus of the eruption eastward between Fáskrúðs and Stöðvarfjörð, and a second from Vatnsdalsfjall near Njarðvík, also to the east, the area upon which the ashes and pumice rained would hardly be less than 100 square miles. Also assuming the average depth of the layer at 3 inches, we must assign to the discharge of March 19 a weight of 3840 tons."

"It is reported that the ash showers have ruined twenty farms in the Jökulsdal (between the Lagarfjót and the eastern Jökulsá) and in the northern Múla Sýsla, where the owners are preparing to abandon their property. The position of the Fjótalsdalsherað, where the scoriaceous rains fell thickest, are the Jökulsdal, Fell, Fjótalsdal, Skogar, Skriðdal, Vellir, and Eyðathingá. Heavy and terrible showers also desolated Norðfjörð, Reyðarfjörð, Mývafjörð, and

Loðmundarfjörð. Where the land has abundance of water, as in parts of Skriðdal, Vellir, and Eyðathingá, the farmers hope that the ashes will disappear during the spring, and that they will be dissolved by the rains." This interesting letter concludes with an exhortation "not to abandon the holdings for good," and with excellent advice about the measures to be taken. Yet it owns that "from this fearful visitation all husbandry in the east country must come to utter ruin," and the less Icelanders are advised not to emigrate the better for the island.

The writer of "An Appeal for Iceland" ("Times," July 1, 1875), compares this mild and harmless eruption, which has not destroyed a single life, with the terrible convulsions of 1783, which killed some 14,000 human beings. He also calculates the destruction of pastures to the extent of 2500 to 3000 square miles, while popular computations make 4000 square miles the habitable area of Iceland.

According to Páll Pálsson only four farms on the west of the Jökulsá have suffered severely. These are, going from south to north, Brú, Eyrikstaðir, Hákonarstaðir, and Arnórstaðir. Herra Thóroður Guðjónsson, factor at Húsavík, never even heard of the eruption till I showed him the newspapers. Finally, the brown shadings in my chart, marking the eastern and north-eastern limits of the ash showers, and copied from an Iceland map obligingly lent to me by my friend, Mr Robert Mackay Smith, may be allowed to prove that the damage extends over a small area.

Mr Jón A. Hjaltalín, of the Advocate's Library, Edinburgh, received (June 26) trustworthy accounts of the ash and pumice rain. "It extended over several parts of Norður Múlasýsla and Stöður Múlasýsla, depositing a layer about 1½ inches thick. In some places the winds have carried it off, but sundry parishes will be unable to keep their live stock at home this summer. Next hot season, however, it is expected that the pastures will be all right."

Mr W. L. Watt, who has just ridden over the ground, found the pumice and ashes beginning about the middle course of the Svartá (N. lat. 64° 50'), and extending northwards to Herðubreið (65° 10'); or a total depth of 20 to 25 miles, bounded eastward by the Jökulsá, where the country is not, and never has been, habited by man.

The limits of this paper do not permit me to enter into all the details of the last eruption in Iceland; but the reader may be assured that the outline and the main features of the subject are correctly drawn.

The following Gentlemen were elected Fellows of the Society:—

BRUCE ALLAN BREMNER, M.D.

REV. FRANCIS EDWARD BELCOMBE.



PROCEEDINGS

OF THE

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NINETY-THIRD SESSION.

Monday, 20th December 1875.

SIR WILLIAM THOMSON, President, in the Chair.

The following Communications were read:—

1. Vortex Statics. By Sir William Thomson.

(*Abstract.*)

The subject of this paper is *steady motion of vortices.*

1. Extended definition of "steady motion." The motion of any system of solid or fluid or solid and fluid matter is said to be steady when its configuration remains equal and similar, and the velocities of homologous particles equal, however the configuration may move in space, and however distant individual material particles may at one time be from the points homologous to their positions at another time.

2. Examples of steady and not steady motion:—

(1.) A rigid body symmetrical round an axis, set to rotate round any axis through its centre of gravity, and left free, performs steady motion. Not so a body having three unequal principal moments of inertia.

(2.) A rigid body of any shape, in an infinite homogeneous liquid, rotating uniformly round any, always the same, fixed line, and moving uniformly parallel to this line, is a case of steady motion.

(3.) A perforated rigid body in an infinite liquid moving in the

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