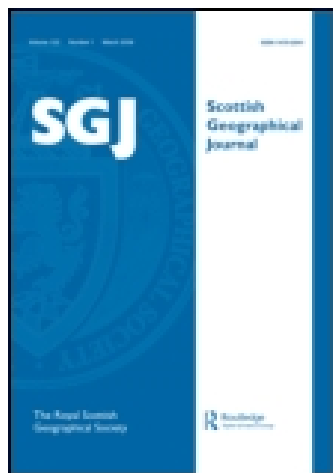


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UK



Scottish Geographical Magazine

Publication details, including instructions for authors
and subscription information:

<http://www.tandfonline.com/loi/rsgj19>

Report to council

Hugh Robert Mill D.Sc. F.R.S.E. F.C.S.

Published online: 30 Jan 2008.

To cite this article: Hugh Robert Mill D.Sc. F.R.S.E. F.C.S. (1887) Report to council,
Scottish Geographical Magazine, 3:10, 521-530, DOI: [10.1080/14702548708555261](https://doi.org/10.1080/14702548708555261)

To link to this article: <http://dx.doi.org/10.1080/14702548708555261>

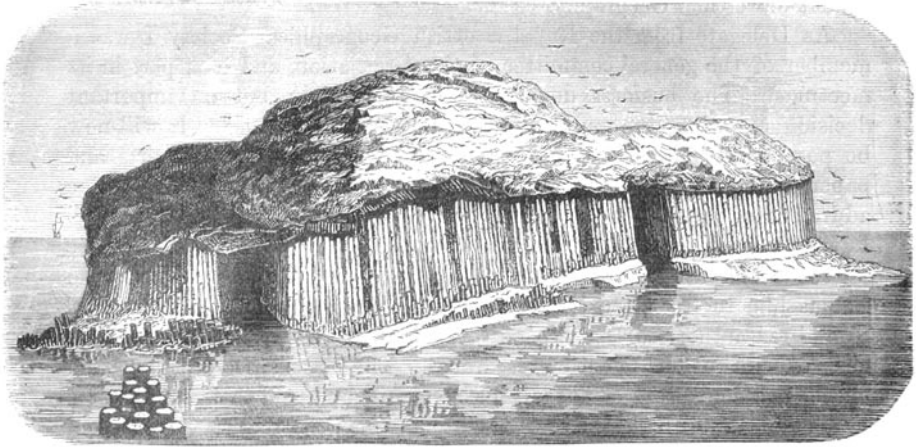
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how four rectangular tunnels came to be driven in homogeneous rock by waves which could not possibly reach the places said to have been eroded.

Let me point the moral by adding an illustration taken from *Our Earth and its Story*. It is the latest contribution to the series of pictures misrepresenting Staffa, and, I believe, was taken from *Unser Wissen von der Erde* (Fig. 92, p. 277), by Alfred Kirchhoff. It will doubtless



"Fingal's Cave," etc. Showing basalt taking a columnar form.
(From *Our Earth and its Story*, by permission of the publishers.)

achieve a wide circulation, especially as the other cuts in the same number of this deservedly popular series are remarkable for their accuracy and beauty.

REPORT TO COUNCIL.

BY HUGH ROBERT MILL, D.Sc., F.R.S.E., F.C.S.

The Society's Delegate to the British Association, 1887.

GENTLEMEN,—I have the honour to submit my Report as Delegate to the Manchester meeting of the British Association. This gathering exceeded in numbers any previous meeting of the Association, 3833 members and associates being present. A special feature was the unusually large muster of foreign men of science, who took a leading part in the business of the sections, and in the more social gatherings of the afternoons and evenings.

The opening meeting in the Free Trade Hall on August 31st was attended by as large and brilliant an assemblage as ever inaugurated the annual conference on Science; and although the somewhat special nature of Sir Henry Roscoe's address made it difficult for many of his hearers to

follow him throughout, it was listened to faithfully, and the fine sentiment from Lessing with which he closed called out enthusiastic applause.

The one remark of a general nature conveyed the hope that this meeting might result in the formation of an international conference for the advancement of Science, through which much good work might be done in the future. Should this suggestion be carried out no science will benefit more than Geography.

As Delegate from the Royal Scottish Geographical Society I was a member of the general committee of the Association, and took part in its meetings. The business done was mainly formal; but an important decision regarding the publication of Reports was ratified. It will now be possible to purchase separately all the more important reports and papers before the publication of the annual volume containing them. The addresses of presidents of sections are also available in the same way. It was resolved to approach the proprietor of Stonehenge, at the instance of the conference of delegates of Corresponding Societies, in order to induce him to pay attention to the state of the monoliths. The general committee authorised the expenditure of £1973 as grants to committees charged with various scientific researches. The importance of this part of the Association's work can hardly be over-estimated, and this year the sum voted is nearly half the value of the grant which the British Government provides annually for the "endowment" of research. The Geographical Section receives only £5, for the investigation of the depth of permanently frozen soil in polar regions; but thanks to the generous want of definition given to Geography, 22 out of the 45 grants may claim notice here. These are:—

Mathematics and Physics.—Ben Nevis Observatory, £150; Solar Radiation, £10; Differential Gravity and Meter, £10.

Geology.—Sea Beach near Bridlington, £20; Erosion of the Sea-Coasts, £15; Erratic Blocks, £10; Underground Water, £5; Volcanic Phenomena of Japan, £50; Volcanic Phenomena of Vesuvius, £20.

Biology.—Zoology and Botany of the West Indies, £100; Flora of Bahamas, £100; Marine Laboratory, Plymouth, £100; Migration of Birds, £30; Flora of China, £75; Naples Zoological Station, £100; Marine Station, Granton, £50; Peradeniya Botanical Station, £50.

Geography.—Depth of Frozen Soil, £5.

Mechanical Science.—Investigations of Estuaries by means of Models, £200.

Anthropology.—North-Western Tribes of Canada, £100; Prehistoric Race in the Greek Islands, £20; Anthropological Notes and Queries, £50.

Sir Frederick Bramwell was elected President for next year's meeting at Bath, and the invitation from Newcastle-upon-Tyne for the year 1889 was accepted.

Two Conferences of the Delegates of Corresponding Societies were held under the chairmanship of Professor Boyd Dawkins, both of which I attended. Thirty-three societies were represented, and most of the

delegates put in an appearance at the meetings. The report of the Corresponding Societies' Committee was read and adopted, and remarks were made by several gentlemen on the work done by their respective societies in regard to observations carried on in various departments of science. The importance of cataloguing erratic blocks and observing earth tremors was specially urged upon local societies. Mr. Ralph Richardson, F.R.S.E., suggested that the Erratic Blocks Committee should include Scotland as well as England and Wales in their reports, pointing out that a committee of the Royal Society of Edinburgh had in a series of lengthy reports laid up an immense store of data regarding Scottish boulders, which was freely available for tabulation and discussion. The general feeling of the Conference was at first that it might appear like an aspersion on the admirable and complete work of the Edinburgh Society if such a course were followed; but, after some discussion, it was determined to include the name of Scotland. With reference to local museums, Mr. Pullar mentioned that of the Perth Natural History Society as being singularly complete, clearly arranged, and serviceable. From the remarks of several delegates, it would appear that considerable advance has been made both in the contents and arrangement of local museums.

The Chairman called the special attention of Scottish delegates to the fact that, when the proprietors of ancient monuments in Scotland were willing to place these under the protection of the Act for Preservation, the Government Board in Edinburgh, through which the transfer must be made, placed various obstacles in the way. Considering the importance of an efficient system of inspection and of protecting prehistoric remains, it was extremely desirable that this should be simplified as much as possible. I have therefore to suggest that you should inquire into this, and take any action you may see fit, as it appears to me precisely one of those cases in which the intervention of your Society would be justifiable and efficacious.

In addition to the fields of research already covered by local societies, I suggested that in some cases good work might be done in the observation of temperature in rivers and lakes in connection with a committee of Section A,¹ which was appointed to consider this matter on my proposal.

Considerable dissatisfaction was expressed at the sectional President's addresses taking place at the same time, the only case of mutual accommodation being, as usual, that of Sections A and B. As the President's address has, as a rule, no bearing on the papers read to the meetings, it would appear easy to arrange for it to be delivered on some day and at some hour which would not clash with other sections, and this without in any way impeding the ordinary business. Another matter to which I think it well to direct your attention, is the want of system still pre-

¹ Consisting of Mr. J. Murray (Secretary), Dr. A. Buchan, Professor Chrystal, Mr. J. Y. Buchanan, Rev. C. J. Steward, Hon. Ralph Abercromby, Mr. D. Cunningham, Mr. Isaac Roberts, and Dr. H. R. Mill.

valent in conducting the sectional proceedings. Both my predecessors have referred to this in the case of Section E; but the evil is universal. The long sitting, from eleven to three, and the impossibility of judging at what time a given paper will be taken, are productive of much dissatisfaction and annoyance. Only people of very great importance can command an audience in the section rooms between one and two o'clock; and there was hardly a day in any section on which the papers coming late on the list could be read properly, or discussed at any length. This was felt to be unjust, particularly by foreign members, who regarded the discussion of papers as the most important purpose of the Association. Some simple arrangements would greatly improve matters, while additional system in the work of the sectional secretaries and firmness on the part of the chairman would remove all cause of complaint. As a rule, half an hour is ample for committee work. Let the committee meet as usual at 10; the section at 10.30, and sit until 12.45; adjourn for lunch until 1.30, and remain at work until 3.30. This would ensure a more uniform attendance of members, and greater freshness in the speakers; it would also prevent the undignified devouring of sandwiches by the chairman while papers are being read. Again, if the secretaries were to assign the time for each paper, and the chairman would see that it was adhered to, and also limit critical remarks to ten or five minutes, according to the hour and the state of business, there would be much greater satisfaction for all concerned. The arrangements for garden parties, conversaciones, and excursions were, as they have been for many years, much more perfect than those for the scientific meetings.

The Manchester meeting was one of more than usual interest to geographers, for, besides a number of valuable papers read to Section E, there were many bearing directly upon the subject submitted to other sections. To those which related to Geography in its geological, biological, and anthropological aspects, I shall not refer; but two papers claim special attention—one read to Section A, the other to Section G. The former, by Professor E. Hull, F.R.S., discussed the effect of continental land in altering the level of adjacent oceans. Of the enormous magnitude of this effect, I may venture to say no geographer has hitherto had any idea. The author's abstract will be printed as a note in the *Magazine*, and to it I refer for details, merely observing that if his calculations are correct the height of the Bolivian Andes above the true mean sea-level is more than 2000 feet greater than that generally assumed. Our notions of the relief of the earth as a whole must be greatly modified when we cease to view the ocean-surface as part of a sphere concentric with the lithosphere.

In the Section of Mechanical Science, Professor Osborne Reynolds showed how in a flat-bottomed estuary the action of tides, as determined by the form of the banks, would result in the formation of the shoals and sand-banks which actually occur. A most ingenious model of the Mersey, in which mimic tides of short period were kept up, showed the actual

processes of growth by which it is most likely that river-entrance assumed its present form. An abstract of this paper, describing the successful application of laboratory experiments to explain the process of natural geographical change, will be printed in the *Magazine*.

Sir Francis de Winton's evening lecture on exploration in Central Africa was a model of what a popular lecture should be. He handled his familiar theme with a systematic clearness and quiet enthusiasm which secured the sympathy and unfaltering interest of his large audience.

I must now, following the example of former delegates, give in some detail an account of the doings of geographers at home in Section E. The officers of the section were the following:—

President.—Colonel Sir Charles Warren, R.E., G.C.M.G., F.R.S.

Vice-Presidents.—H. W. Bates, F.R.S.; John Rae, M.D., LL.D., F.R.S.; Henry Lee; Admiral Sir Erasmus Ommanney, C.B., F.R.S.; General Sir H. E. L. Thuillier, R.A., C.S.I., F.R.S.; General J. T. Walker, R.E., C.B., LL.D., F.R.S.; Colonel Sir C. W. Wilson, R.E., K.C.B., K.C.M.G., D.C.L., F.R.S.

Secretaries.—Rev. L. C. Casartelli, M.A., Ph.D.; J. S. Keltie; H. J. Mackinder, M.A.; E. G. Ravenstein (*Recorder*).

Committee.—Dr. Ginsburg; Colonel Holdich, R.E.; J. Arthur Hutton; Professor Libbey; Hugh Robert Mill, D.Sc., F.R.S.E.; E. Delmar Morgan; Dr. G. Neumayer; Lieut.-Colonel Sir R. L. Playfair, K.C.M.G.; Josiah Pierce; Sir Rawson W. Rawson, C.B., K.C.M.G.; Trelawney W. Saunders; Eli Sowerbutts; Rev. S. Alfred Steinthal; Rev. Canon Tristram, D.D., LL.D., F.R.S.; Coutts Trotter; M. van Eetvelde; Sir Harry Verney; Captain Verney, R.N.; Rev. Thomas Wakefield; Professor A. W. Ward; Cope Whitehouse, M.A.; Colonel Sir Francis de Winton, K.C.M.G.; Dr. Ludwig Wolf.

Delegate.—T. Cushing.

The Section held four meetings, and, besides the President's address, thirty-five papers and reports were presented; but several of these were hurried over in a manner which took away much of their value.

Following is a complete statement of the daily proceedings:—

Thursday, September 1.

The President's Address.

1. *Dr. Ludwig Wolf*.—Exploration on the Upper Kassai and the Sankuru.
2. *Captain Coquilhat*.—The Bangala.
3. *Lieut. Le Marinel*.—The Congo below Stanley Pool.
4. *R. C. Phillips*.—The Lower Congo,—a Sociological Study.
5. *R. E. Dennett*.—A Visit to Diego Cão's Padrão, at the mouth of the Congo.
6. *Dr. A. Oppler*.—On Acclimatisation.

Friday, September 2:—

1. *Cope Whitehouse, M.A.*.—The Raiyan Basin.

2. *Colonel Ardagh, R.E., C.B.*—The Feasibility of the Raiyan Reservoir.
3. *Captain Conyers Surtees.*—The Desert from Dahshur to Aix Raiyan.
4. *Captain R. H. Brown, R.E.*—The Bahr Yusuf.
5. *E. A. Floyer.*—Between the Nile and the Red Sea.
6. *W. Brindley.*—A Visit to the Porphyry Quarries of Gebel Dukhan.
7. *A. B. Wylde.*—On the Red Sea Trade.
8. *Captain C. E. Haynes.*—Matabele Land and the Country between the Zambesi and Limpopo.
9. *Major Sir Herbert Perrott.*—A Note on Houghton, the African Traveller.
10. *John Forrest.*—Western Australia.
11. Second Report of a Committee for inquiring into the depth of the permanently frozen soil in the Polar Regions.

Monday, September 5 :—

1. *Professor Boyd Dawkins.*—The beginning of the Geography of Great Britain.
2. Report of the Committee on the Study of Geography at Oxford and Cambridge.
3. *H. J. Mackinder.*—Geography at the Universities.
4. *G. Skelton Streeter.*—The Ruby Mines of Burma.
5. *J. M'Carthy.*—Siam.
6. *W. J. Stearns.*—An Exploration of the Rio Doce, Brazil.
7. *Professor Libbey.*—On South-Eastern Alaska.

Tuesday, September 6 :—

1. Report of a Committee on a Bathy-Hypsographical Map of the British Islands and the Surrounding Seas.
2. *S. H. Wilkinson, M.A.*—On some Defects of the Ordnance Survey Maps.
3. *Colonel Sir Charles Wilson.*—On the Utilisation of the Ordnance Survey.
4. *Josiah Pierce, jun.*—On the United States Geographical and Geological Survey.
5. *H. R. Mill, D.Sc.*—On a Bathy-Orographical Map of Scotland.
6. *E. G. Ravenstein.*—A Plea for the Meter.
7. *Sir Erasmus Ommanney.*—Report of a Committee on Antarctic Research.
8. *A. R. Colquhoun.*—Formosa.
9. *John Yeats, LL.D.*—On the Study of the Natural Divisions of the Earth, rather than the National ones, as the Scientific Basis of Commercial Geography.
10. *J. J. Cardwell.*—Realistic Teaching in Geography.
11. *A. Park.*—The Teaching of Geography in the Elementary Schools of England.

The President's Address dealt with the importance of studying Geo-

graphy in its wider aspects, and with the best method of presenting its facts to children. In all he said on this subject Sir Charles Warren closely agrees with Dr. A. Geikie's views, as expressed in his *Teaching of Geography*. The latter part of the address is of peculiar value, enforcing as it does the necessity for geographical knowledge amongst statesmen and politicians, and proving, by many examples, what troubles have arisen through ignorance or neglect of geographical principles in fixing boundaries between neighbouring States.

The whole of Thursday, September 1, was, after the Address, occupied with Africa, chiefly with the region of the Congo; and the papers were followed by a very lively discussion. This turned chiefly on the adaptability of the Congo district for European settlements, and statements of the most contradictory nature were made. All that could be gathered from a review of the debate is that in some parts of the vast Congo lands Europeans can, with suitable precautions, live securely; but in other parts, and everywhere without special care, the climate is terribly fatal to white settlers.

Egypt and the Red Sea engrossed most attention on Friday, the paper of the day being that by Mr. Cope Whitehouse on the Raiyan Basin. Mr. Whitehouse has long cherished a scheme, which most people have viewed as chimerical, to regulate the flow of the Nile by storing up a supply of water during floods, and allowing it to return to the river in the dry season. Now, armed with complete surveys and statistics, and backed up by military engineers of standing, he proves the practicability of his project. He shows how, with an expenditure of a million pounds, two and a half million acres of waste land on the Nile delta can be reclaimed, and a revenue of two millions sterling become available every year. Papers on the trade of the Red Sea and the porphyry quarries of Gebel Dukhan appear to promise better things for Egypt and the Sudan in the future; and the general opinion expressed during a long discussion was that this country, hitherto so unfortunate, might soon by wise treatment become not only self-supporting, but a valuable possession for any European power.

Captain Haynes gave a favourable account of Metabele Land in South Africa as a field for colonisation; it has a good climate and plenty of arable land on the high ground, as well as gold mines.

The Second Report of the Committee for inquiring into the Depth of Permanently Frozen Ground in the Polar Regions presents some valuable data from York Factory, in 57° N. lat., where the maximum penetration of frost was found to be 102 inches. The committee was reappointed, and its further reports will be looked for with interest.

Very important work was got through on Monday. The scope and teaching of Geography were under debate for several hours, and provoked some admirable speeches. Professor Boyd Dawkins sketched the geological geography of Great Britain in the Archæan and Silurian periods, pointing out the changes in position of the coast-line of the old continent of Archæa.

He complained that hitherto geographers had greatly neglected this department of their science ; a statement which reference to the first two volumes of the *Scottish Geographical Magazine* would easily confute. Mr. H. J. Mackinder, the newly appointed Reader in Geography at Oxford, protested against such a purely geological paper being read to the section. Geography, he said, owed much to the results of Geology, nothing to its methods.

Mr. E. G. Ravenstein read the Report of the Committee on the Study of Geography at Oxford and Cambridge, which has completed its labours successfully, and secured adequate recognition of Geography as a science at the two great English universities. Mr. Mackinder followed with a clear and definite statement of his views on the teaching of Geography in the universities. He would give two courses of lectures, one on the principles of Geography, the other on the Geography of a special region. In the first course the methods and principles of geographical observation, reasoning, and exposition would be laid down ; and the fundamental facts of physiography described from the geographical standpoint. The discussion turned largely, as might be expected, on the relation of Geography to Geology and other sciences, and doubts were expressed as to whether the newly appointed Reader could carry out his scheme of teaching. To this Mr. Mackinder replied that the practicability of his methods had already been proved in the course of a series of successful University Extension lectures.

The remainder of this sitting was occupied with papers of the usual special type, which gave little opportunity for difference of opinion.

It was determined to take the remaining eleven papers on Tuesday, a decision which was to be regretted, as the greater number were so hastily run through as to leave it an open question whether it would not have been better for their authors to have withdrawn them altogether. Abundant time was devoted to the series of dissertations and discussions on maps, and the readers of the first five papers had no cause for complaint. The Committee on a Bathy-Hypsographical Map of the British Islands and Surrounding Seas reported on their work. It has been resolved that the land and sea be contoured at equal intervals, as referred to the Ordnance datum level, and that colour be used to bring out the spaces between the contour-lines. A number of specimen maps of the Medway and the Linnhe Loch districts were shown coloured according to different principles, the most effective being that in which the colours of the rainbow were employed in their natural order. Captain S. H. Wilkinson pointed out some defects of the Ordnance Survey Maps in a paper which occupied three-quarters of an hour, but was summarised in three lines :

"The Ordnance Survey does not give us detailed maps of Great Britain on scales reduced from 1 : 63,000, which are much wanted.

"The representation of the ground in both the 1-inch and the 6-inch maps is inadequate."

The discussion on this paper was extremely animated, many omis-

sions of the Survey being pointed out by other speakers. Sir Charles Wilson, in defending the work, said that the maps in future would be contoured below sea-level, but he did not reply to a question as to the delineation of deep rock basins filled with fresh water. He vindicated the Ordnance Survey as to mathematical accuracy and correct publication, showing that it compared favourably with the real work, though perhaps not with the artistic finish, of the maps of any Continental government ; but he complained that in every attempt at improved methods or increased efficiency the Survey was checked by the false economical views of the Treasury, or the unreasonableness of the House of Commons.

Mr. Trelawney Saunders pointed out that, after all, not the surveyors, but the people of Great Britain, who complained of the maps, were to blame for all defects. Let them move Parliament, and any reform could be carried out.

Sir Charles Wilson then gave a short account of the origin of the Ordnance Survey in the year 1747, at Fort Augustus, when military roads were being constructed through the Highlands, and of its subsequent progress. He enlarged on the value of the cadastral survey on the scale of 25 inches to a mile, as applied to land legislation in Ireland.

The Geographical and Geological Surveys of the United States were described by Mr. Josiah Pierce, junr. ; and other papers of greater or less importance were brought forward.

Admiral Sir Erasmus Ommanney, in the five minutes allotted to him, gave a brief and hurried summary of the report of the Antarctic Committee, but no discussion on it was allowed. The importance of Antarctic research from the points of scientific geography, meteorology, and general physics is difficult to overrate, and has certainly been greatly underestimated at the Manchester meeting. A detailed statement of the present position of the question will be given in the *Magazine*.

It is impossible to give in a few words a clear idea of the advances of Geography described in the sittings of Section E. The growing difficulty of defining Geography, and the increasing necessity of finding some dividing line from Geology especially, were often expressed. The value of the map as the basis of Geographical teaching was more fully recognised, and the necessity of cartographical reform so long felt seems at last to be resulting in practical improvements. Africa still claimed most attention ; but more prominence was given to questions of economic and social interest than to exploration of new ground. The popularity of Section E is great, because it is not sharply cut off from A, C, D, F, G, and H, but forms a sort of common ground where specialists may meet and talk without special knowledge to boast of, or peculiar ignorance to make them ashamed.

The Hand-book to Manchester, published by the Association, unfortunately presents a sorry contrast both in bulk and quality to the Birmingham Hand-book of last year. The information given regarding the city and its surroundings is scant ; and some of the writers are apparently

much more familiar with what they describe than with how to describe it. It would be unwise to put the book in the hands of a foreigner who desires to learn to speak English grammatically.

If the weather during the Association Meeting was inclement, it served only to bring out the careful forethought of the Local Committee who had planned so well for the comfort and convenience of the visitors. The hospitality of the Manchester people was worthy of the occasion; and the entertainments in the Royal Jubilee Exhibition, the Town Hall, Peel Park, and elsewhere, were carried through with great success. The excursions also on Saturday and Thursday were in most cases well attended, and thoroughly appreciated.

CURRENTS, ICE, WINDS, ETC., OF ICELAND.¹

It is well known to all mariners of the northern seas how difficult and dangerous it is to navigate the waters contiguous to the shores of Iceland, and that the difficulties and dangers are due to the insufficient knowledge they possess as to the hydrographic relations; to the want of detailed maps and technical directions for navigation; to the peculiar magnetic conditions, and the conditions affecting the currents and ice, which are not less peculiar; to the violent storms, thick foggy weather, long nights, and the absence of lighthouses on the shores. Setting aside certain short notices, there appear to be only two publications of recent times which deal with this subject, viz., Lieutenant C. F. Wandel's *Bemärkninger til Beseilingen af Islands Kyster* and Thoroddsen's *Den Grönländska Drifisen vid Island*. The former contains the results of observations and experiences affecting the currents and tides, the fogs and weather, during a three years' cruise in Icelandic waters; the latter treats of the ice which visits the island nearly every year, and is based upon information afforded by native writers during a period of nearly 700 years, going back to the beginning of the thirteenth century.

Currents and Tides.—The tides make a complete circuit of the island, the flood-tide following the sun, the ebb going in the opposite direction. On the west coast the flood-tide proceeds northwards, entering all the fjords on their southern side, and emerging from them on their northern side. The ebb-tide flows southwards, entering the northern side of the fjords and coming out along their southern side. The flood-tide then passes in succession along the north coast eastwards, the east coast southwards, and the south coast westwards. The ebb-tide of course circuits the island in the corresponding opposite directions. The initiation of ebb and flood does not take place off Iceland with the regularity which it displays off the English coasts, for instance. This seems to be partly

¹ Excerpted and abridged from *Annalen der Hydrographie*, Heft 7, 1887.