U. S. STATE DEPARTMENT.

A REPORT

ON THE

RESOURCES

OF

ICELAND AND GREENLAND.

COMPILED BY

BENJAMIN MILLS PEIRCE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1868.

REPORT.

WASHINGTON CITY, *April* 24, 1868.

SIR: When you did me the honor last summer to call my attention to the treaty negotiated by you with Denmark, by which we acquired the important islands of St. Thomas and St. John, I ventured to suggest to you the propriety of obtaining from the same power Greenland, and probably Iceland also. You thought the suggestion worthy of serious consideration, and requested me to communicate to you in writing my views and the facts on the subject, that they might be on the files of the department and ready for use whenever the question might be considered hereafter by the government. In compliance with that request this report is made.

The books, maps, and authorities to be obtained here were so scanty that I applied for aid to Mr. Carlile P. Patterson, a distinguished assistant of the United States Coast Survey, for assistance, stating to him, confidentially, the purpose for which the application was made. The result was the very able and exhaustive report (which I handed you a few days since) of Mr. Benjamin M. Peirce, indorsed and adopted by Professor Benjamin Peirce, the eminent head of our Coast Survey. Relying mainly on the authentic facts given in that report, I will now discuss the subject, beginning with Iceland.

This large island has an area of 40,000 square miles, being about equal to that of the State of Ohio. It is 130 miles east of Greenland, and 850 miles west from Norway. By location, then, it belongs to the western hemisphere, and is an insular dependency of the North American continent. Only about one-tenth part of its surface (entirely on the coast) is now inhabited. About one-third part of its area is agricultural, one-third heath, and one-third mountains and lava. It has "fields beautifully green, mountains clothed in purple heath, and the atmosphere is of astonishing purity." "The lava in time becomes soil and pasture-land." Much of the heath can be made pasture-land. About one-third part of the males are farmers, the remainder are mainly occupied in the mines and fisheries. The population of Iceland is about 70,000, but in view of its pasture and arable lands, its valuable mines, its splendid fisheries, and its unsurpassed hydraulic power, it could, when fully developed, sustain a population exceeding 1,000,000. It has been greatly neglected by Denmark. The Icelanders complain of this, and look forward with hope to association with the United States. It has numerous lakes, rivers, bays, estuaries, and fiords, with many good harbors. Four of its rivers equal or exceed 100 miles in length, and several of them, at a distance of 60 miles from the sea, are as large as the Hudson river at Poughkeepsie. It is misnamed Iceland, for, owing to the Gulf Stream, "its climate is fine and almost temperate." Its mean temperature by Fahrenheit is 40°; summer temperature of its capital, 56°; winter, 29° 30′, or about that of St. John's, which is 16° of latitude south of Iceland. Its winter temperature is about that of Denmark. "The months of July and August are delightfully mild and pleasant;" "recommended to consumptives." There are over 100 warm springs in the geysir region; their temperature 251 to 260. There are many valuable sulphur springs; but the sulphur mountains, beds, and mines are very rich and extensive, easily worked, and of immense value. The sulphur is supplied at half the cost of that furnished by the Sicilian mines,

which it is believed will soon be exhausted. The possession of these mines as a part of our territory is a question of vital magnitude.

Besides these sulphur mines there is in Iceland "a remarkable mountain of obsidian." There are also vast beds of lignite of great value. "The grass lands of Iceland, with their superb fisheries, are their great wealth." The grass is rich and soft, feeding vast flocks of sheep, cattle, and horses, the price of the latter being but $10 each. Wool, mutton, horses, fish, sulphur, oil, and eider-down, constitute the principal exports. Iceland moss is found in profusion, and is very valuable. Potatoes and some other vegetables are raised, but no wheat. The fisheries include the whale, shark, seal, salmon, trout, cod, herring, haddock, &c., &c. The fisheries are most extensive and among the best in the world. "The French had in 1860 269 vessels and 7,000 seamen engaged in the cod fishery of Iceland." Salt abounds also; the valuable Iceland spar, or double refracting crystal, magnificent zeolites, and splendid calcedonies.

Iceland, together with Greenland, if ours, would become most valuable to us for an independent American line of interoceanic telegraph. No ocean line by this route would exceed 660 miles.

The religion of Iceland is Lutheran. There is a college at Bessestadhir, and a more modern gymnasium at Reykjavík. Education is universal; all can read and write. Icelandic literature is highly advanced. The Icelanders are a very handsome race, with frank and manly countenances and superabounding hospitality. Morals are excellent, crimes almost unknown, and they have no soldiers or police.

GREENLAND.

This is the largest island in the world. It extends, according to Petermann, (a very high authority,) from longitude 20 west of London to 175 east, thus passing nearly half round the globe. Its area, thus elongated, would be about 1,800,000 square miles, or largely more than half the size of all Europe, but with a far greater shore line. Not a hundredth part of this vast region has been explored, but the geologic structure indicates great mineral wealth. Greenland extends, according to Petermann, from north latitude 59° 57′ 30″ to within 50 miles of the North pole, with a length of several thousand miles. The open Polar sea of our American explorers is regarded by Petermann as only a large bay, north of which the land closes again. This may be, although it would still leave a smaller Polar sea; but in view of the discoveries of Wrangel, and still later of an American captain in the Arctic ocean, north of Behring's straits, is it not probable that a portion of the land elongated by Petermann, west of our supposed Polar sea, may not be continuous, but, as suggested by General T. L. Kane, a congeries of islands, (somewhat resembling the Aleutian group,) still constituting a part of Greenland, but leaving probable openings between these islands to the Polar sea and the North pole? In view, also, of the mild temperature at Behring's straits, and of the fact that Parry ascended to latitude 82° 47′ unobstructed by land and with none in view, is not the proper route by these straits for our next expedition to the North pole, and should not balloons similar to those used in military reconnoissances be elevated when necessary to descry distant objects?

The shores of Greenland much more than those of any other country are indented with deep bays, inlets, estuaries, and fiords, some of them possibly extending from the western to the eastern coast, presenting an immense shore line, and furnishing most extensive and protected fishing grounds. "These inlets are bordered by meadow lands, beech and willow, whence the name of Greenland." The population, neglected by Denmark, lives mainly by hunting, including furs and the fisheries.

Greenland has in vast quantities whale, walrus, seal, and shark, cod, ivory-cod, salmon, salmon-trout, and herring; foxes, wolf, reindeer, bear, hare, myriads of

birds, including the king duck, eider duck, dorskin, petrel, gull, brent, burgomaster, goose, killiwoke, lolard, and sea swallow, &c., &c. Good coal is found on the western coast at various points, extending far north, most cheaply mined, and close to good harbors. From the best of these northern harbors of Greenland there is believed to be practicable summer ocean steam navigation 1,500 miles to Alaska, extending, also, through Behring's straits to China or Japan, or southward to Sitka, Puget sound, the Oregon river, San Francisco, &c., &c. This Greenland and Alaska coal may possibly render this transit practicable, and would be of immense value in connection with the fisheries.

The whale fisheries of Greenland, in 1864, were of the value of $400,000. The climate of south Greenland is one of "unusual healthfulness, and clear atmosphere." The limits of summer are from May to September. All the shores and inlets of Greenland abound with animal life, such as fish, birds, &c. Kane states the all-important fact of *a vast increase of animal life as you approach the most northern arctic waters*. The rocks and geology of Greenland, as before stated, besides the valuable coal discovered, indicate vast mineral wealth. Kryolite, a most important mineral, and of very rapidly increasing use and value, is found *only* in Greenland. One of the mines is 80 feet thick. This mineral is mined in large quantities, its rapid development being due in great part to American enterprise. It is used in the manufacture of soap, soda, and soda salts, and yields a residue which has a great value as a flux in the treatment of difficult metallic ores. It also makes a fine glass, and has been employed in the manufacture of *aluminium*, and its alloys, a most valuable metal, being very brilliant, one-third the weight of zinc and one-fourth that of silver, good for coins, much used in France, one-third the price of silver, valuable for jewelry, tenacity equal to steel, valuable for watch cases, mirrors, spectacle cases, opera and field-glass cases, pendulum rods and small weights and balances, instruments of precision and where great lightness is required, spoons, forks, dinner service, cooking apparatus, being unaltered by water, vinegar, salt, and other organic matter. The mines appear to be inexhaustible, and are of great and rapidly increasing value. Geologists all look for *new and immense* mineral developments in Greenland. Kane's book is most valuable. He found "fabulous numbers of whales in Whale sound; swarming also with sea animals and myriads of birds." Hayes describes "the green meadows there as a paradise, with swarms of whales, walruses, &c., and in adjacent seas." On the extreme north coast the north winter winds bring *mild weather*, because they come, as believed, from what the Russians call Polynya, referring, in some way, to a Polar sea. Wrangel observed that the northwest winds, as well as some of the northeast, brought with them a thick, moist fog, so that the clothes and tents were wet through.

These are the main facts as to Greenland and Iceland, taken chiefly from Mr. Peirce's great report, which I consider as a most valuable contribution to science.

I have heretofore expressed the opinion that we should purchase Iceland and Greenland, but especially the latter. The reasons are political and commercial.

The proof has heretofore been submitted by me, that the government, recently partially established in British America, called the Dominion of Canada, was gotten up in England in a spirit of bitter hostility to the United States. It then was, and still is, intended to embrace all British America, extending from the Atlantic to the Pacific, with a railroad from Halifax to Puget sound, and an area exceeding that of the United States prior to the purchase of Alaska. By this great purchase, we have flanked British America on the Arctic and Pacific, cutting her off entirely from the latter ocean from north latitude 54° 40′ to 72°, leaving the new dominion but 5° 40′ on the Pacific, pressed between Alaska on the north and California, Oregon, and Washington Territory on the south, with even British Columbia now being rapidly Americanized. Now, the acquisition

of Greenland will flank British America for thousands of miles on the north and west, and greatly increase her inducements, peacefully and cheerfully, to become a part of the American Union.

The shore line of Iceland, measuring round its whole coast and islets, bays, rivers, and fiords, up to the head of tide-water, and back to the sea, is nearly half that of our whole coast when our Constitution was framed. Hence its immense and valuable fisheries.

And now as to Greenland. The same glacial action which has cut up Iceland into so many inlets and fiords has, so far as explanations have been made, produced similar results, on a much larger scale, in Greenland, thus probably rendering its shore-line nearly equal to that of all the United States before the purchase of Alaska. Hence, Greenland has immense fisheries, most of which are undeveloped. But all our explorers attest the important fact that, just as you proceed north in the Arctic towards the pole, the profusion of animal life, including birds and fishes, *is wonderfully increased.* Now, the nation with such vast fisheries must not only have the largest commercial marine, but the best and greatest number of seamen, and, as a consequence, enabled promptly, when required by any emergency, to put in operation the largest and most effective navy. Such vast fisheries and extensive coasts and numerous harbors, especially with abundant good coal there, must greatly antedate the period when the United States will command the commerce of the world.

But there are other most important considerations connected with extended coasts and great fisheries. The fisheries are capable of furnishing more and cheaper food than the land. The reasons are—

1. The ocean surface is nearly four times that of the land; the area being 145,000,000 square miles of ocean surface to 52,000,000 of land.

2. The ocean everywhere produces fish, from the equator to the pole, the profusion of submarine animals increasing as you go north, up to a point but 433 miles from the pole, and believed to extend there; whereas, in consequence of mountains, deserts, and the temperature of the surface of the earth in very high latitudes, less than half its surface can be cultivated so as to produce food in any appreciable quantities.

3. The temperature of the ocean, in high latitudes, being much warmer than that of the land surface, there is increased profusion of submarine animal life, especially in the Arctic and Atlantic seas, where, on account of extreme cold, the land surface produces no food. In warm latitudes the deep-sea temperature diminishes with the depth, until a certain point, below which it maintains an equable temperature of 40° Fahrenheit. The temperature of the ocean in latitude 70° (many degrees warmer than the land surface) is the same at all depths. There are wonderful provisions for the multiplication of animal life in the ocean, and it moderates both heat and cold. These are additional reasons in favor of the existence of a Polar sea, filled with a far greater profusion of submarine animal life than any other seas, and, as a consequence, possessing far the best fisheries. Indeed, as fish progress northward, on account of the better ocean temperature there, as also because the marine food there is much more abundant, there can be little doubt that the open Polar sea will furnish fisheries of *incredible value.*

4. The ocean produces food in all latitudes for the support of animal submarine life. These are squid, (the principal food of the whale,) also abundance of nutritious sea-grasses, &c., upon which the fish feed. Besides, as the earth is more and more cultivated, and farms, as well as towns and cities, drained by creeks and rivers to the seas, the submarine food is correspondingly augmented. Even in mid-ocean the phosphorescence observed there is produced by the presence in the water of myriads of living animals.

5. Whilst the earth produces food by ploughing its surface only a few inches deep, the ocean supplies myriads of fish, tier upon tier, thousands of fathoms

deep. Thus, the registered take of herrings in the Scotch fisheries, in 1861, was nine hundred millions, whilst that of Norway, in the latitude of Iceland and Greenland, was far greater.

Perhaps, however, the main reason why the ocean produces so much more food for man than the land is, that whilst land animals only give birth to one or two of their young at a time, some fish produce millions of ova, to be matured into life. Thus, a female cod has been found to contain 3,400,000 ova; and other fish ova varying from several millions to 36,000. Hence the vast success attending the increased production of fish by transfer, by sowing the spawn, and other methods known to ichthyology.

This is a science of great importance, just in its infancy, and gives augmented value to the possession, by any nation, of extensive coasts and great fisheries. Indeed, should a largely increased density of the population of the earth augment greatly the difficulty of supplying sufficient food for man, we must look mainly to the fisheries and improve ichthyological science to prevent starvation.

Besides vegetable food for fish, the ocean produces salt, magnesia, lime, potash, iodine, bromide, &c., &c. Indeed, it is quite certain that the ocean, with equal capital and labor, can produce much greater riches than the land, and that the ratio is constantly increasing in favor of the ocean. The ocean is emphatically the poor man's home, with no monopoly or individual ownership.

The same philosophic reasons, growing out of the far warmer temperature of the Arctic ocean, as compared with the land, which indicate a Polar sea at the north, would lead to the conclusion that a similar Polar sea exists at the South pole, and that in the Northern and Polar seas will be found far the greatest fisheries of the globe, and exhaustless reservoirs of food for man.

The account of the Coast Survey for the invaluable information procured by them, is, I think, just and reasonable.

I have the honor to be your obedient servant,

R. J. WALKER.

Hon. WILLIAM H. SEWARD,
Secretary of State.

COAST SURVEY OFFICE,
Washington, December 16, 1867.

SIR: After a very careful examination of this report of Mr. Benjamin M. Peirce, I find it so exhaustive and so well and concisely elaborated, that it does not appear to me that I can improve it. I therefore adopt it as my own, and respectfully address it to you.

Very respectfully, your obedient servant,

BENJAMIN PEIRCE,
Superintendent United States Coast Survey.

Hon. WILLIAM H. SEWARD,
Secretary of State.

CAMBRIDGE, *December* 14, 1867.

SIR: I have the honor to submit to you the result of the labors which you instructed me to undertake, during the latter part of August of this year. I understood you to desire as full a description as was possible of the condition and resources of Greenland and Iceland. This I have done by the kindness of Mr. Sibley, librarian of Harvard University, and Mr. Winsor, of the Boston

Public Library, who afforded me the use of all the valuable works bearing upon the subject which were under their care. Where these libraries have failed me, I have been enabled to consult the maps of Iceland in the hydrographic office of the Naval Department. I am also indebted to Mr. Schroder, of the Astor Library, for access to some important statistical publications of the Danish government; and I have relied in some cases upon the generosity of private individuals.

The methods adopted for the drawing up of my article were these: First, to collect together all the more valuable authorities upon the subject. Secondly, to make a careful abstract of these works. Thirdly, to arrange and compare these notes, classify them and put them into an intelligible shape. Fourthly, to consult all the less important authorities, such as dictionary and review articles, and compare them with my own. Fifthly, to develop as far as possible the special consideration of the more important subjects, by means of the best authorities on these subjects. Sixthly, to make a careful revision of my work. Seventhly, to put the results into a written form.

I have endeavored, as far as possible, to state the authorities, with the precise citations, wherever a fact is given. In some rare cases this rule has not been followed, either because the fact was one which needed no authority to vouch for it, or else because it came from an authority which could not be cited. It is needless to say that in many of these rare cases the statements are a part of the general result of a long reading of the matter.

I have avoided all expression of opinion except where the opinion seemed a necessary consequence of the facts.

I have borne in mind the object of the article, that it should treat of the "condition and resources" of the countries, and have thus avoided the narration of their histories, except where the two were evidently connected.

I have been as brief as possible, and rather aimed to give a string of bare facts than to make an interesting article.

In many cases quotation marks would strictly be regular, but as this article has no pretension to originality, and no other object than information, they have generally been omitted.

I would say that I have been enabled by my professional education to discuss with some confidence the sulphur mines of Iceland and the uses of kryolite in Greenland.

I would suggest to you, sir, as being the most important parts of the article, those concerning the sulphur, fisheries, agriculture, and future of Iceland, and those concerning the explorations of Greenland. The article translated from Petermann is very valuable.

Hoping, sir, that this will meet with your approval, I remain, very respectfully, yours,

BEN. M. PEIRCE, A. B.,
Mining Engineer.

Professor BENJAMIN PEIRCE, LL. D.,
Superintendent United States Coast Survey.

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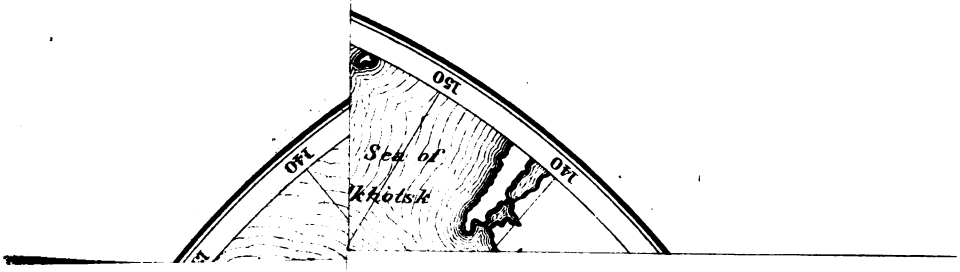

and his companions, Dr. Holland and Mr. Bright, of the history, zoology, and

[1] Hend., Preface.

[2] See Hend., Map and Errata.

N. B.—For a formal list of authorities and of abbreviations, see Appendix.

ICELAND.

AUTHORITIES.

We have to complain of the meagreness of the data available for the formation of an opinion upon the present resources and condition of Iceland. Most of the facts given in this paper have been painfully picked out from the books of travellers, who fill the bulk of their account with narrative, personal adventure, and travelling experiences. Facts and statistics, important to us, come in as incidental observations generally, and need to be disentangled from a mass of useless matter. This remark applies especially to the books of later travellers—precisely those which would be likely to contain the most valuable, because the most recent observations. We find ourselves forced to rely, in many matters, on the accounts of earlier tourists, who tell us of the Iceland of long ago. Sir George Steuart Mackenzie's book, for instance, is admirably arranged and carefully compiled, but, having been written fifty years ago, it cannot have so much weight as a more recent one of the same kind would have had. The missionary, Ebenezer Henderson, too, is an invaluable authority, inasmuch as he seems to be the only traveller who has described the whole of the island, east, west, north, and south; but he also made his journey half a century ago.

Yet it must be borne in mind that Iceland has changed very little within the last fifty years. Even her population has remained nearly stationary, and we may suppose that the condition and resources as tabulated for us in 1804 are much the same in 1867. It is quite safe on this ground, we believe, to place the intelligent and detailed accounts of Mackenzie, Henderson, and Dillon on the same footing as the modern authorities, Forbes, Miles, the Oxonian, and Dufferin. On the whole, too, the accounts generally agree whenever the same matters are treated by two authors; we find the modern travellers repeating the old stories of Henderson and Mackenzie.

Older writers.—Almost all the Icelandic tourists have confined their travels to the western parts, near the capital, Reykjavík, penetrating into the interior only far enough to scale Mount Hekla, and see the far-famed Geysirs. Some of them went to the northern coasts, as the "Oxonian" did, and visited some of the villages and fishing stations in the remote regions of the island. Ebenezer Henderson, with the perseverance and pluck that everywhere characterize the missionary, visited the whole of the inhabited part of the country, and it is to him that we must always refer when we have to speak of the southern and eastern coasts. He made his visit during the years 1814 and 1815, with the professed purpose "exclusively to investigate the wants of its inhabitants with respect to the Holy Scriptures;"[1] but, in writing his book, he does not forget to enlighten us on other matters, on the topography of the island, and the common occupations of its inhabitants. He made three journeys in the country, always taking Reykjavík as his starting point. In his first journey he cut across the desolate interior, steering northward to the Eyjafjördhr, whence he visited the north and east districts, and afterwards the southern coast settlements. His second journey covered the northwestern districts, and his third was in part a repetition of his first, though by no means so extensive.[2]

Mackenzie went to Iceland in 1810, with the principal object of scientific research, himself taking the charge of the geological and mineralogical survey, and his companions, Dr. Holland and Mr. Bright, of the history, zoology, and

[1] Hend., Preface. [2] See Hend., Map and Errata.

botany.[1] All these matters have been well treated, and, in connection with many statistical tables, have given the work a high standing as an authority on Iceland.

The only other early accounts which have been found useful, are those of Drs. Von Troil and Hooker. Von Troil accompanied Sir Joseph Banks in his voyage to Iceland in 1772, and his letters contain a large amount of information, very well digested and arranged. Hooker's tour was made in the summer of 1809, and his book, in two large volumes octavo, is one of the standard authorities upon the subject.

Dillon.—The Hon. Arthur Dillon's little book on Iceland and Lapland, the first volume of which relates entirely to the former country, was written after a stay at Reykjavík during the winter of 1834. It is a good book so far as it goes, but his travels into the interior were not extensive. His observations on the rigor of the Icelandic winter, and his intelligent remarks on agriculture and the fisheries, have a certain interest.

Gaimard.—In the year 1835, the French government having to fit out an expedition in search of a lost ship of war, it was thought to be consonant to the dignity of a great nation, especially of one which claimed to be in the van of civilization, to give to the voyage the character of a scientific exploration. Another expedition of the same character was made in the next year, and the result of both is the magnificent series of eight works published under the direction of M. Paul Gaimard. Several of these volumes treat of subjects upon which it would not be proper to enter with any detail in the present report; as the history, the literature, the fauna and flora, the magnetic forces, &c. Of the others we have endeavored to make a good use. Another result of the same great expedition, are the interesting "Lettres" of M. X. Marmier. They contain, however, but little which relates to the present inquiries.

Sartorius von Waltershausen.—An excellent series of sketches of the physical geography and geology of Iceland are given by Sartorius von Waltershausen, who visited the island in the year 1846, and published a series of papers on the subject, in successive following years, in the Göttinger Studien.

Ida Pfeiffer.—Bayard Taylor, in his Cyclopædia of Modern Travel,[2] describes Ida Pfeiffer's visit to Iceland in 1854. She tells us, at least through Taylor, of nothing which other writers do not describe more fully; and were she to give us anything new, we should hardly know how to receive the testimony from a witness of whom another authority says:[3] "Where she does not knowingly tell direct falsehoods, the guesses she makes about those regions that she does not visit—while stating that she does—show her to be bad at guess-work."

We have no account of the country again till Pliny Miles, an American, goes there, in 1852, on a pleasure tour. His testimony seems generally trustworthy, but he attempts little more than an entertaining narrative of his adventures.

We have not mentioned Bunsen's visit with Des Cloiseaux, in 1846,[4] because we have been unable to procure a connected account of their expedition. The scientific results, which were the chief object of these distinguished savants, are, however, well appreciated by the whole learned world. It does not form a part of our present plan to present these results, though we shall speak incidentally of certain observations on the volcanoes and springs.

Recent travellers.—We now come to authorities, whose testimony is more recent than any others, and therefore worthy of more immediate attention. Lord Dufferin visited Iceland in 1856, and published a most entertaining, perhaps a little extravagant,[5] story of his experiences. Charles S. Forbes, of the British navy, was in Iceland a few years after, and gives us, in his book, some valuable details in regard to the resources and future prospects of the country.

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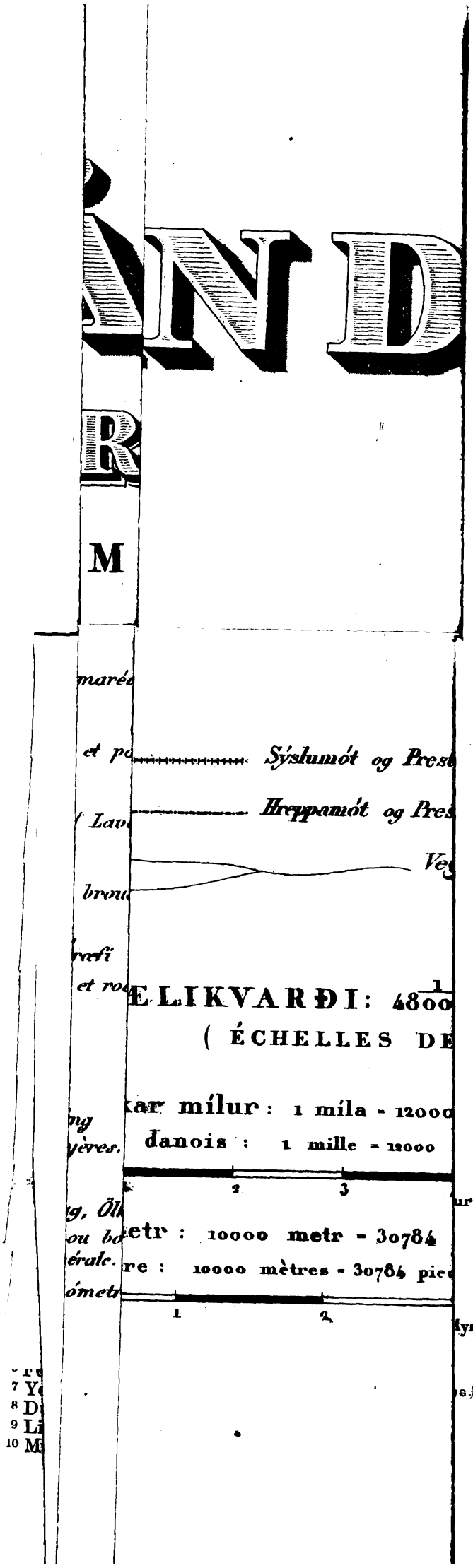
[1] Mck., Preface.
[2] P. 134.
[3] Miles, p. 161.
[4] Som., p. 163.
[5] See Ox., p. 55.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Messrs. Preyer and Zirkel have published an account of an extensive journey through the island, made in the summer of 1860. We have drawn many facts from their accurate and interesting book. The Reverend F. Metcalf ("the Oxonian") gives us his notes on his journey of 1866, which also have some interest. Besides these, there are hardly any authorities bearing directly on our subject, unless it be E. T. Holland and the expedition of Prince Napoleon. The latter spent only a very short time in the country, and the observations made were, we believe, entirely scientific. E. T. Holland's account we have carefully read. He is a member of the well known *Alpine Club*, and made a thorough tour of Iceland in the summer of 1861, only a small part of which, unhappily, has been described in a sketch given in the first volume of the second series of "Peaks, Passes, and Glaciers." His narrative is a mere story of personal adventure. Murray's Guide Book to Iceland is only a repetition of what he found in Henderson, Lord Dufferin, &c.[1]

Other authorities.—Besides books thus intimately connected with the subject, we have found many others that gave us stray facts, detached data, and statistics. We have accepted with the utmost confidence the carefully prepared articles on Iceland in the Encyclopædia Britannica, 8th edition, vol. xii.,[2] Lippincott's Gazetteer, and Chambers's Cyclopædia. The trade accounts of the Parliamentary Reports of Great Britain gave us some valuable data by which to appreciate the position of commerce between the island and England. Then there are the geographies, especially Herschel's and Mrs. Somerville's. The Annals of Petermann and the Reports of the Royal Geographical Society have been consulted.

Maps.—As for maps, besides those of Mackenzie, Henderson, the Oxonian, and others, we have examined the magnificent four-sheet map of Ólsen and the maps in Berghaus's and Kiepert's Atlases. Ólsen's map, published in 1844, is based on a survey conducted, about the beginning of the present century, by the Danish government. The actual construction and publication of the map is, however, due to the Literary Society[3] at Reykjavík, and is a noble monument of the patriotism and scientific thoroughness of Iceland. There hardly exists so minute a delineation of any other country.[4] The Oxonian's map, which purports to be reduced from Ólsen, is not to be relied on in its details.

GEOGRAPHY.

Iceland (Icelandic: *Ísland*; Danish and German: *Island*; French: *Islande*,) is situated 130 miles from the southeast coast of Greenland, about 850 miles west of Norway,[5] and 500 miles northwest of Scotland.[6] It thus seems to be rather American in its connections than European, especially as we may add that its most important and most populous coast is the western. Its extreme latitudes are 63° 24′ and 66° 33′ north, and its extreme longitudes 13° 33′ and 24° 36′ west.[5] It is one-fifth larger than Ireland,[7 8 9] its area being somewhere from 38,000 to 40,000 square miles.[5 6 8 9 10] Its length is 313 English statute miles. Its

[1] We could not procure the "Iceland, its Scenes and Sagas," by S. Baring Gould; 1863. It is probably a good authority. For lists of works on Iceland see Pinkerton's Voyages. 4to. Philadelphia. 1810. Vol. 1, p. 624. Thaarup's Statistik udsigt over den danske Stat. 1825. Page 644. Marmier's Lettres sur l'Islande, p. 31. G. Med., p. 203.

[2] The authorities cited in the Encyc. Brit. are Von Troil, (1772,) Mackenzie, (1810,) Henderson, (1814–'15,) Barrow, (1834,) and Chambers, (1856.)

[3] G. Litt., p. 268; P. and Z., p. 47.

[4] Duff., pp. 110, 111.

[5] From Ólsen's chart the longitude of Copenhagen being taken as 347° 25′, on the authority of the American Ephemeris.

[6] Forbes, pp. 2, 22; Bowen, p. 160.

[7] Yet see Encyc., p. 197; but conf. p. 503.

[8] Duff., p. 140.

[9] Lipp. pp. 888, 910.

[10] Murray, p. 90.

breadth is 192 miles.[1] It suffices, however, for our present purpose, to know that the island is larger than Ireland, and nearly as large as the State of New York.

General aspect.—Of this 38,000 square miles only about one-eighth[2] or one-tenth[3] is inhabited, this almost entirely upon the coasts.[2 4] The remaining 33,000 square miles consist of ice mountains, *(jökulls,)* desolate valleys, and lava tracts.[2] From Ólsen's map[5] we learn that one-third is agricultural or green, one-third is covered with heath, and the remaining third consists of snow mountains, sandy deserts, and lava.[6]

At first sight Iceland is a country totally devoid of interest from a material point of view. A passing glance at the general aspect is deceptive, and one who merely examines the quotations which occur in the pages immediately following may well wonder what there is to recommend a further examination; it is only after a thorough consideration of the details that he can find in the seeming desolation the sure promise, if not the existence, of a rich prosperity. But let us see what Iceland is at first glance.

Henderson says,[7] "the general aspect of the country is the most rugged and dreary imaginable." Tracts of lava traverse the country in every direction, but it is in the interior especially that these immense deserts abound. Here, says the same author,[8] one "may travel 200 miles without perceiving the smallest symptom of animated being of any description whatever; and even in traversing the inhabited parts he still finds himself more surrounded by nature than by human society, owing to the distance from one farm-house to another." Forbes's "General Glance" is still more gloomy. He gives us a graphic description of Iceland's dreariness thus:[9]

> Its interior, as a whole, is one vast tract of lava, desert, and ice-mountains—jökulls, as they are termed; these occupy one-tenth part of the island, and never have been, and never can be traversed. Two tracts across this desert serve for communication between north and south, but not a blade of grass or shrub exists in that deathlike solitude; lava, lava, lava, is the eternal vista. The habitable coasts consist for the most part of marshy districts; there the Icelander builds his house, and collects the rank grass for his sheep and cattle; and on the banks of the numerous rivers, which from jökull and lake pour into every fiord, more favored patches are found, sometimes stretching a few miles into the interior, the whole affording a bare subsistence for the scanty population.
>
> Grain will not ripen in their transient and uncertain summer, and must all be brought from Europe; even their grass crop is often destroyed by the polar ice, which in some years imbelts the island, especially its northern and western coasts, and occasions such incessant rain that it is impossible to dry the hay. When this happens famine follows, for on their cows and ewes they principally depend for their sustenance during the long Arctic winter—dried cod's heads being their only reserve. The bodies of the fish they are obliged to barter in exchange for European commodities, bread among the number, of which the masses (and that only in the parts adjacent to the trading stations) are able to afford more than one meal a week.
>
> Paradoxical as it may seem, there are plenty of forests but no trees, for the natives dignify the vast tracts of stunted birch bushes, which are found in some parts, with that title, though they seldom average above six feet in height, never more than nine, and are useless but for fuel. The western and southern coasts are, however, plentifully strewed with drift-timber, swept up by the Gulf Stream, which, striking the southwest corner of the island, diverges right and left along its shores, and materially affects the climate,[10] the usual winter in the southern districts not being more severe than in Denmark.

Miles says[11] that the first things which strike the spectator on seeing Iceland are the total absence of trees, the beautiful green of the fields, the mountains clothed in purple heath, and the astonishing purity of the atmosphere.

An Icelandic priest told the Oxonian[12] he would find in the country "nothing but bogs, rocks, precipices; precipices, rocks, bogs; ice, snow, lava; lava, snow, ice; rivers and torrents; torrents and rivers."

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[1] These distances are calculated from Ólsen's chart.
[2] Duff., p. 140.
[3] Forbes, pp. 23, 24.
[4] Dill., p. 97.
[5] See above, p. 9.
[6] Miles, p. 212.
[7] Hend., p. 1.
[8] Hend., preface, p. IX.
[9] Forbes, pp. 24, 25, 26.
[10] See, too, on this point, Petermann's Mittheilungen for 1865, p. 146.
[11] Miles, p. 50.
[12] Ox., p. 56.

Such, indeed, is the vast interior. Two desolate table-lands stretch from northeast to southwest, broken by craggy jökulls, and separated by a barren valley which reaches from sea to sea, and a hundred miles in width.[1] All this is covered with crumbling lava, which renders it very difficult to cross even in the lines of travel. The horses' feet are hurt by the uneven, jagged road.[2]

The most extensive region of jökulls is in the southeastern districts. An enormous ice-mountain range occupies 3,000 or 4,000 square miles.[3] It is a vast glacier similar in its aspect and phenomena to other glaciers.

In brief, we learn from all accounts that, taken as a whole, few countries present a less inviting aspect than Iceland. On the coasts alone do we find the indications of material prosperity—green lands and a source of wealth in the sea.

Volcanoes.—But even here the vast volcanic action which probably once created the island[4] has sometimes revisited it to lay it waste again. The lava, crumbling into dust and exposed to the weather, becomes soil, grows heath, and later becomes pasture land, which by a new eruption may be again devastated. There are about 30 volcanoes in Iceland,[5] of which the principal are:[6] Öræfa,[7] Skaptár, Kötlugja, Sólheimar, Mýrdal, Torfa, Eyjafjalla, Arnarfell, Eyrik, Ball, Bláfell, Geitland, Snæfell, Dránga, and Gláma, jökulls or ice mountains; Krafla, (pronounced Krabla,) Hrafntinnuhryggr, Leirhnúkr, Bjarnaflag, Hítahóll, Hrossaborg, Herdhubreidh, Smjörfjall, Trölladýngja, Kerlíngarfjöll, Hekla, Skjaldbreidh, Skardhsheidhi, Henglafjöll, and the range of mountains which stretch from thence to Cape Reykjanes.

The highest mountain in Iceland is Öræfa jökull, which is 6,409 feet[8] (6,241 Danish feet[9]) above the sea level. Snæfell is 5,965 feet; Eyjafjalla jökull is

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[1] Som., p. 161.

[2] Hend., p. 47; Forbes, p. 71; Duff., p. 49.

[3] Forbes, p. 281; Lipp., p. 888; Hend., p. 195.

[4] Forbes, p. 22.

[5] Lipp., p. 888; according to Preyer and Zirkel, there are 27 points at which there have been eruptions within historic knowledge.

[6] Hend., p. 2.

[7] Here, and throughout this report, the Icelandic orthography is followed as closely as possible. The following notes on the pronunciation of that language may be found useful: *a* is pronounced like *a* in *father*, but shorter, (German short *a*;) *á*, nearly like *ou* in *loud*; *e*, not joined to another vowel, is like *e* in *men*; *è* represents the compound sound of *ye* in the English word *yet*; *i* is sounded like our short *i*, but, at the end of a word, more obscurely, like the *a* in *lemma*; *í* is like *ee* in *feel*; *o* is like *o* in *hot*; *ó* stands between the *o* in *lo* and the *o* in *lore*; *u*, not followed by *r*, is sometimes sounded like the French *u* and sometimes like the English *u* in *under*; *ur* sounds like *er* in *better*; *ú* is sounded like our *oo*; *y* and *ý* are sounded like *i* and *í*; *æ* and *œ* are nearly like our long *i* in *find*; *au* is like *oi* in English; *ei* and *ey* approach our long *a*; *ö* is like the German *œ* or *ö* in *Gœthe*. The consonants are sounded as in English, with the following exceptions: *f*, in the middle of a word before *g* and *j*, sounds like the German *w*, or nearly like the English *v*; before *m*, *n*, *l*, or *dh*, like *b*; before *s* or *t*, like *p*; *g* approaches to our *y* in sound in three cases, namely, if it is at the end of a word, if preceded by a vowel and followed by *j*, and if it is preceded by a vowel and followed by *r* or *l*; *h* is silent before *l*, *n*, *r*, *j*; *hv* is pronounced like our *qu*; *j* is pronounced like our *y*; *kv* is our *qu*; *ll* sounds as *ddl*; *nn* as *dn*; *p* before *t*, or at the end of a word, has commonly the sound of *f*; *r* before *n* or *l* has the sound of *t*; at the end of a word, after a consonant, constitutes a *syllable*, and is sometimes written *ur*; *s* between vowels or before *j*, nearly like English *z*, (German weak *s*;) *v* is equivalent to the German *w*, and resembles English *v*; *x* is variously sounded as *ss*, *gs*, and *ks*; *dh* is written in this article for the Icelandic letter which has the sound of *th* in *thine*, and *th* for that which has the sound of *th* in *thin*. These letters resemble the corresponding characters in Anglo-Saxon. *Z* is sounded sometimes as *ts*, sometimes as *ds*, and sometimes as *dhs*. The letters *c*, *q*, and *w*, are not used in Icelandic, but *ck* was formerly sometimes written for *kk*, and *q* for *hv* or *kv*. It will be observed that the *accent* does not denote an emphatic syllable.—(Preyer and Zirkel, Anhang F, pp. 491–496.)

[8] Lipp., p. 888.

[9] Oxonian.

5,579 feet; Hekla is 5,110 feet. Since the year 1000 A. D. there have been 26 eruptions of Mount Hekla,[1] and of all the volcanoes no less than 84.[2] Miles thus enumerates[1] the eruptions of Hekla:

No.	Year.	Interval.	No.	Year.	Interval.
1	1004	— years.	13	1436	46 years.
2	1029	25 do.	14	1510	74 do.
3	1105	76 do.	15	1554	44 do.
4	1113	8 do.	16	1583	29 do.
5	1157	44 do.	17	1619	36 do.
6	1206	49 do.	18	1625	6 do.
7	1222	16 do.	19	1636	11 do.
8	1294	72 do.	20	1693	57 do.
9	1300	6 do.	21	1728	35 do.
10	1340	40 do.	22	1754	26 do.
11	1374	34 do.	23	1766–'68	12 do.
12	1390	16 do.	24	1845–'46	77 do.

But by far the most important and destructive eruption in the history of Iceland was the celebrated one of Skaptár jökull in 1783. This produced a widespread devastation, and was the precursor to famine and disease, which carried off an enormous percentage of the inhabitants. Eleven thousand people perished from these combined causes. The narrative of this dreadful occurrence is given us in all its horrible details by Mackenzie, and almost all writers on Iceland.[3] It is not for us here to record anything more than the bare fact. Besides this eruption, the other most destructive ones occurred in 1294, 1341, 1636, 1693, and 1848.[4] For a description of these we must refer to the narratives of the different writers. It is enough for our purpose to know that volcanic eruption has been an important feature in the history of Iceland, and is a determining cause of much unhappiness and ill-success.

Hot springs.—The most remarkable phenomena of Iceland, which have made the country interesting to science, are the warm springs, of which the *Geysirs* are the most celebrated and the most curious. Besides these latter sources, which are situated in the southwestern part of the island, not far from Lake Thíngvalla, Henderson mentions[5] the Reykir springs, in the district of Ölfus, the sulphur springs of Krísuvík in the south, those of Reykjaddálr in the west—of both of which we shall have occasion to speak more largely when discussing the mineral wealth of the island—the springs of Hveravellir, in the interior, and those of Krafla in the north.

Great Geysir.—The Great Geysir, with its attendant springs, is one of the "lions" of Iceland, which every traveller visits and every writer describes. For the praise of its beauty and the description of its wonderful eruptions we must send our readers to the narratives of Forbes and Mackenzie. The latter, a scientific man, made some valuable observations on the phenomena of eruption, and suggests a theory of its cause; but it is to the learned Bunsen and Des Cloiseaux that we owe the most trustworthy and extended facts. According to them,[6] the Geysir takes rise from the bottom of a basin of about 50 feet in diameter. Its depth is in the neighborhood of 80 feet. There is generally an interval of 20 or 30 hours betweeen the eruptions, which vary much in intensity and force.[7] The observations on the temperature show that the average temperature of the water is 260°.5 F. before an eruption, and after, 251°.5 F. Bunsen's theory explains all the phenomena, though it disagrees with the opinion of others, who attribute the eruptions to the combined action of water, sulphuretted hydrogen, and car-

[1] Miles, pp. 153, 154; who omits the eruptions of 1597 and 1772, (Pr. and Z., pp. 448, 461.)
[2] Enumerated and described by Preyer and Zirkel, Anhang D; see also G., II, p. 327; H., I, p. 107; v. Tr., pp. 628, 686, 691.
[3] See, especially, Pr. and Z., p. 462.
[4] Lipp., p. 888.
[5] Hend., p. 5.
[6] Som., p. 163.
[7] Forbes, p. 237; Lord Duff., p. 127.

bonic acid.[1] He attributes the violent explosion and expulsion of water to the loss of the air contained in the water—a known effect. Thus the water requires a higher heat to make it boil, at which moment the production of vapor becomes so enormous as to cause high pressure and finally eruption.[2]

Other springs.—There are over a hundred other springs in the Geysir region.[3] The *Strokkr*, about 140 yards distant from the Great Geysir, is the principal of these. It is a little more than 44 feet in depth; the diameter of its orifice is eight feet, which diminishes in descending.[4] This wonderful spring can be excited to eruption at almost any time by throwing in grass sods and choking it till it "goes off" and flings its water high up into the air, often with great violence.[5] The sulphur springs have great interest, not only to the scientific explorer, but also to the practical man, for they have deposited about their mouths immense beds of sulphur, a source one day or another of great material wealth, and a spur to Icelandic industry. The smoky valley of Reykjaddálr contain numerous columns of steam, where, as in all similar districts, the inhabitants cook food.[6] From a material stand-point these springs have a possible value as sources of heat, as supplies of certain salts, in some instances as reservoirs of valuable sulphur, and in all probability as possessing valuable medicinal qualities.

Mineral waters.—We give, from several sources, some analyses of Iceland's mineral waters:

Great Geysir water, (Dr. Black,) per 10,000 grains:[7]

Soda	0.95
Alumina	0.48
Silica	5.40
Muriate of soda	2.46
Dry sulphate of soda	1.46
	10.75

Reykir water, per 10,000 grains:[7]

Soda	0.51
Alumina	0.05
Silica	3.73
Muriate of soda	2.90
Dry sulphate of soda	1.28
	8.47

Water of the Great Geysir, sp. gr., 1.001; smelling of sulphuretted hydrogen. Analyzed by Damour;[8] 1,000 parts of water contain:

Sulphate of potassa	0.0180
Sulphate of soda	0.1343
Sulphate of magnesia	0.0091
Chloride of sodium	0.2638
Soda	0.1227
Silica	0.5190
Sulphur	0.0036
Carbonic acid	0.1520

Water of the spring Badstofa, (Reykir.) Analyzed by Damour:[8]

Sulphate of potassa	0.0229
Sulphate of soda	0.0103
Sulphate of lime	0.0400
Choride of sodium	0.2873
Soda	0.0711
Silica	0.2630
Sulphur	0.0061
Carbonic acid	undetermined.

[1] Forbes, p. 238.
[2] See Duff., foot-note, p. 127.
[3] Miles, p. 100.
[4] Som., p. 163.
[5] For description see Duff., pp. 118, 119, and others.
[6] Forbes, pp. 122, 123.
[7] Mck., p. 389, et sqq.
[8] Annales de Chimie et de Physique. Series 3. Vol. XIX, p. 470.

Water of the spring south of Hvergarden, (Reykir.) Analyzed by Damour.[1] Parts of the following contained in 1,000 parts of water:

Chlorine	0.1732
Soda	0.3188
Silica	0.3240
Sulphur	0.0091
Sulphuric acid	undetermined.
Carbonic acid	undetermined.

Water of the spring Stocehever, within the Hvergarden. Analyzed by Damour;[1] 1,000 parts of water contain, in parts, of—

Soda	0.3072
Potassa	0.0150
Silica	0.3160
Sulphur	0.0030
Chlorine	undetermined.
Sulphuric acid	undetermined.
Carbonic acid	undetermined.

Water of the spring of Laugarnes, near Reykjavík. Analyzed by Damour;[1] 1,000 parts contain—

Sulphate of soda	0.0221
Chloride of sodium	0.0547
Soda	0.0508
Silica	0.1350
Sulphur	0.0019
Carbonic acid	undetermined.

Water of a boiling spring, between the northeast coast of Namarfjall and the lava stream of Burfell. Analyzed by Bunsen;[2] 1,000 parts of water contain—

Sulphate of lime	.12712
Sulphate of magnesia	.10662
Sulphate of ammonia	.07333
Sulphate of alumina	.03261
Sulphate of soda	.02674
Sulphate of potassa	.01363
Silica	.04171
Alumina	.00537
Sulphurreted hydrogen	.00820

Water of the Great Geysir. Analyzed by Sandberger;[3] 1,000 parts contain—

Silica	.5097
Carbonate of soda	.1939
Carbonate of ammonia	.0083
Sulphate of soda	.1070
Sulphate of potassa	.0475
Sulphate of magnesia	.0042
Chloride of sodium	.2521
Sulphide of sodium	.0088
Carbonic acid	.0557

Water of the Badhastofa spring at Reykir; by Bickell.[4] Grammes in one litre of water:

Sulphur	.0036
Chlorine	.1426
Carbonic acid	.1019
Sulphuric acid	.0464
Silica	.2373
Soda	.0881
Potassa	.0385
Lime	.0124
Magnesia	.0211

[1] Annales de Chimie et de Physique. Series 3. Vol. XIX, p. 470.
[2] Annalen der Chemie und Pharmacie. Vol. LXII, p. 1.
[3] Ibid., p. 49.
[4] Ibid., vol. LXX, p. 290.

Water of the Geysir (by Bunsen) contains in 1,000 parts—

Silica	.5097
Carbonate of soda	.1939
Sulphate of ammonia	.0083
Sulphate of soda	.1070
Potassa	.0475
Carbonate of magnesia	.0042
Chloride of sodium	.2521
Sulphide of sodium	.0088
Carbonic acid	.0557

Certain Reykir springs are rich in carbonate of lime, which deposits itself at the mouths. Many cold springs contain carbonic acid gas; others are continually agitated by giving off the same.

Rivers.—There are numerous rivers in Iceland, but at present they have no use as channels of communication or as supplies of hydraulic force. In many of them quantities of fine salmon are caught, salted, and sent abroad. The most important streams are the Hvítá, the Thjórsá, the Jökulsá, and the Skjálfjandafljót. The last two have a course each of about one hundred miles. The two former are still longer, and are about as large, sixty miles from the sea, as the Hudson at Poughkeepsie.[1] Many of the travellers have observed the waste of water-power, which might be expended in driving machinery. Dillon, especially, suggests[2] the great advantages of hydraulic force offered by the water-falls and rivers, thus far entirely neglected. He also remarks, in the same connection, on the scarcity of wind-mills. It is hard to see, however, for what purposes machinery could be employed, except, perhaps, for carding, spinning, and working the wool which forms so large a part of the wealth of the Icelanders. But, at present, the cheapness of manual labor is great; the demand for extensive manufactories is small. It is well, however, to record the fact that vast hydraulic force is there, ready to be used when demanded.

CLIMATE.

As the knowledge of the climate of a country gives us the key to understanding its fauna, its agriculture, its industry, and the character of its people, we have examined with great care all the accounts which the various travellers and observers have given us about that of Iceland. From its extreme northern position we might expect to find an extreme severity of cold, which would class it with Greenland and the northeastern parts of British America. But upon glancing at the fine map in Berghaus's Atlas, for instance, we find that the isothermal lines about here by no means follow the circles of latitude. The line which, as far as latitude is concerned, would touch Iceland, swerves far away from it, and leaves that island in the enjoyment of a fine and almost temperate climate. Other circumstances besides solar heat come in to determine a country's climate, and here there is a powerful force to temper its Arctic cold. It is almost impossible to exaggerate the influence of the great Gulf Stream, which, sweeping up from the south, brings with it a store of southern warmth to bless the islanders, and which so materially affects the climate that in the south of Iceland the winter is not more severe than in Denmark.[3] We give a few figures taken from several sources, in order to give our ideas a more definite form. The degrees of temperature are given in the Fahrenheit scale. The mean temperature of the south is 39°; that of the centre is 36°.[4] This is probably too low. At Reykjavik (southwest) Lippincott's authority states

[1] Lipp., p. 888; see Miles, pp. 118, 119. Thjórsá, 150 miles long, falls over 3,000 feet in less than 60 miles, and carries more water to the ocean than the Hudson. (Miles, p. 172.)

[2] Dill., p. 81.

[3] See Petermann's Mittheilungen for 1865, p. 155; also Forbes, p. 25, and Som., p. 164.

[4] Som., p. 164.

it as 40°, that of summer being 56°, and that of winter 29°.30.[1] Berghaus[2] states the winter cold as 14°, the summer heat as 50°, and maximum difference of mean temperature for a month as 27°. He puts the temperature curve of the warmest month at 50°. During February Dillon saw the mercury several times as low as —10°, but this was during a very severe winter, as he says.[3] Miles assures us that the thermometer is seldom lower than +12° or +18°.[4] In Appendix B we give a table abridged from Petermann's Mittheilungen, vol. 22, p. 118, which shows a comparison between different places in the Arctic regions. A thorough examination of this table is very instructive. We only mention a few facts. The mean temperature of the year at Reykjavík, whose latitude is about 16° further north, is less by 1° than that at St. John's. It is about the same as that at Iluluk, more than 10° to the south, and its summer weather is much warmer than in Iluluk. Reykjavík (latitude 64° 8′) is much warmer than any place whose temperature is recorded between latitudes 55° and 85°, except St. Petersburg, (latitude 59° 56′,) and Sitka, (latitude 57° 3′.) Eyafjördhr is in the north of Iceland; it is in latitude 66° 30′, but it is warmer than Cumberland House, latitude 53° 57′, and much warmer than any place in its own latitude. It would be interesting to study the comparison of these places with others in regard to the differences of climate from month to month, from extreme to extreme; but this belongs rather to science than to an essay like the present one. There is a great variability in the climate of Iceland. Violent storms—often accompanied with thunder[5]—are frequent. There is likely to be continued rain in some parts.[6] This uncertainty is the result, in great part, of the polar ice, which sometimes floats from Greenland into the northern and western fiords, and causes great cold. The north and south differ very much in the character of their climates. In the north, says Metcalfe, the winter is much keener, the summer much milder, than in the south.[7] In the north the prevailing wind is from the north; snow beginning at the first of October, lasts till the middle of May.[8] The temperature has been known as low as 35 degrees below the zero point.[8] In the south there is no prevailing wind;[7] a north wind there brings clear weather.[7] July and August, in the south, are delightfully mild and pleasant.[4] They are the best months for a visit to the country.[9] There is no gradual turning from summer to winter; the frost often hardly leaves the ground till the middle of July,[10] and, to speak strictly, there are but *two* seasons.[11]

Iceland is by no means a warm country, but we have learnt enough to know that its inhabited parts do not deserve the harsh name of Iceland, for the climate is clear and fine, and in summer even warm and pleasant. We have been told that the climate is much recommended to consumptives and persons suffering from constitutional weakness; perhaps the rich fish oil which enters so much into the Iceland bill of fare may have something to do with this fact, if true.

POPULATION.

The population of Iceland to-day is about 70,000. In 1703 it was 50,444.[12,13,14] Then in 1707 and 1708, 16,000 people died of the small-pox.[15] In 1769 there were 46,201[12,13,14] inhabitants; in 1783, 47,287[12,13]; in 1786, 38,142[12]. In 1801 the population was [12,13,14,15,16] 47,240; in 1806 it was 46,349[12]; in 1808, 48,063[12,13];

[1] Lipp., p. 888.
[2] Berghaus's Atlas.
[3] Dill., pp. 167, 168.
[4] Miles, p. 55.
[5] Som., p. 164.
[6] Forbes, p. 25.
[7] Ox., p. 152.
[8] Mck., p. 234.
[9] Murray, p. 90.
[10] Dill., p. 178.
[11] Hend., p. 279.
[12] These numbers are copied from Preyer and Zirkel, p. 483, by whom they were taken from a recent Danish work. For some early estimates see H., vol. I, p. xcvi.
[13] Mck., p. 281.
[14] Meddel., vol. II, page 70.
[15] Hend., p. 20.
[16] Dill., p. 294.

in 1835, 56,035;[1] in 1840, 57,094;[1] in 1842, 53,000;[2] in 1845 it was 58,558;[1] in 1850 it was 59,157,[1 3] and in 1855 it was 64,603.[3] In 1857 it was 66,929,[2] and in 1858, 67,847.[2] (See Appendix C, No. 3.) The average annual rate of increase from 1703 to 1858 was about one-fifth of one per cent., from 1806 to 1858 it was about three-fourths of one per cent.; and from 1850 to 1855 it was about one and a half per cent.; but the fluctuations are so great as to make these general computations of little value.[4]

Our tables (Appendix C, Nos. 1–4) show how the population is divided. We there find that about 52 per cent. of the inhabitants are females; that about two-fifths of the population are under 20 years of age, and about two-fifths between 20 and 50; that about three-fourths of the heads of families, and of those who provide support, are farmers; and more than four-fifths of the entire population derive their maintenance from agriculture. In 1801 there was about one farm to every 10 inhabitants.[5] According to Preyer and Zirkel, 15 per cent. of the births are illegitimate, while in England only nine per cent. are so. Robert gives 1 in $4\frac{5}{7}$ in 1830, and 1 in $6\frac{2}{5}$ in 1834. Marriages take place late in life; and only one person in four marries.

The Icelandic men are rather tall, have frank, open countenances, fair, often very florid, complexion, and flaxen hair.[6 7] The women are inclined to corpulency,[6 8] but otherwise resemble the men. They are not cleanly, and from this cause, as well as from their peculiar food, often suffer from cutaneous diseases.[9] They are said to be cheerful,[10] so honest that the doors are not locked at night in their largest town,[11] strangely frank and unsophisticated, lovers of constitutional liberty[12] and of literature,[13] pious, contented, with remarkable strength of intellect and acuteness, brimful of hospitality, and not given to any crimes or vices except drunkenness.[9] Above all, they possess an enthusiastic affection for their island, which they call "*hinn besta land sem solinn skinnar uppâ*"—the best land the sun shines on.[14]

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[1] Meddel., vol. II, p. 70.

[2] These numbers are copied from Preyer and Zirkel, p. 483, by whom they were taken from a recent Danish work. For some early estimates, see H., vol. I, p. xcvi.

[3] Meddel., vol. IV, p. 3.

[4] Miles, p. 305.

[5] Mck., p. 281.

[6] Hend., p. 20.

[7] Mck., p. 408.

[8] Dill., p. 133.

[9] Hend., p. 20; Forbes, p. 312; Encyc., p. 147; Lipp., p. 888, &c. Hooker relates some horrible anecdotes bearing upon this point, vol. I, pp. 10, 129.

[10] Upon this point Henderson must undoubtedly be regarded as the highest authority, on account of his long stay in the island. He says: "It has been said that, in general, the Icelanders are of a sullen and melancholy disposition; but, after paying the strictest attention to their appearance and habits, I must pronounce the statement inaccurate, and one which could only have been made by those who have had little or no intercourse with the people. On the contrary, I have been surprised at the degree of cheerfulness and vivacity which I have found to prevail among them, and that not unfrequently under circumstances of considerable external depression and want," p. 20. It also excited the surprise of M. Robert to find those affected with elephantiasis (one of the usual symptons of which is, in other countries, an extreme depression) entirely cheerful. (G. Med., p. 24.) This, however, he considers as a peculiarity of the Icelandic form of this disease. Yet the same writer (G., II, p. 22) says that "gaiety seems banished from their hearts," and that "they are never heard to laugh." Marmier (Lettres, p. 22) says: "The Icelanders are grave and silent. They have, perhaps, less of the sentiment of music and the dance than any other people. To see them, one would say that they were all under the influence of that austere nature in the midst of which they are born." On the whole, they seem to combine great seriousness with great tranquility; and this is Robert's opinion, at least in reference to the men. He finds the women have usually a sanguine temperament. (G. Med., p. 149.) But it is impossible accurately to sum up human nature in a few words.

[11] G., II, p. 22.

[12] See Hooker's touching account of the revolution of which he was a witness, vol. II, pp. 1–63.

[13] H., I, p. 39; G. Med., p. 150; Marmier, Lettres, p. 74, &c.

[14] Hend., p. 20; Ox., p. 8; Forbes, p. 7.

The north country peasants are more intelligent than the people of the same class in the south; probably, thinks the "Oxonian," on account of the bracing, keen weather in the north.[1]

HISTORY, RELIGION, AND GOVERNMENT.

Iceland was settled by Norwegian adventurers towards the end of the ninth century.[2] In the year 928 it possessed a considerable population,[3] in which year the whole island was united into one government, republican in character.[4] This government preserved its independence for more than three centuries. About 1260 Iceland was reunited with Norway,[5] but, a century later, passed, with Norway itself, under the dominion of the Danes,[6] to whom it still belongs.

Religion.—The Scandinavian cultus, and especially[7] the worship of Thor, was maintained in Iceland during the 10th century. Christianity was first publicly preached there in 981,[8] and was adopted by law as the national religion in the year 1000.[9] Lutheranism was early introduced into Iceland,[10] and, from 1551 to the present day, it has been the exclusive creed of the island.[11] There are, however, according to Henderson, two schools of religious belief,[12] and Dillon states that but one solitary case of dissent has ever occurred.[13]

It would add some interest, but, on the whole, little present value to this paper to follow the history of Iceland, with greater minuteness, before and after the introduction of Christianity, to discuss the question of the discovery of America by the Icelanders,[14] and to trace in detail the changes which the government has undergone from the beginning to our own day.[15] It is of more importance to know, as bearing new testimony to the exaggerated conservatism and strange stagnation of Iceland, that during the present century the government has remained, with unchanged laws and institutions, in the hands of Denmark, notwithstanding the frequent complaints of injustice and inefficiency. It was only a few years ago, after years of agitation, that trade, formerly confined to Denmark, was thrown open to start a more genuine prosperity in the country.[16]

Division and government.—Iceland was formerly divided into four parts: Northland, Southland, Eastland, Westland; each of which constituted a political jurisdiction, province, or prefecture, (Dan. *amt.*)[17] But there are now but three provinces; those of the north and the east having been consolidated.[18] Each *amt* is subdivided into shires; and each shire[19] (Icel. *sysla*; Dan. *syssel*) into communes *(hreppar.)*[20] The shires are variously enumerated by different authorities.[21] There are about twenty of them. The number of communes is said by Preyer and Zirkel to be 169.[22] All these divisions are derived from the ancient republican constitution of Iceland.[23] Each *amt* is governed by a magistrate (Icel., *amtmadhr;* Dan., *amtmand.*)[24] The *amtmand* who presides over the southern *amt* takes precedence, is charged with ecclesiastical authority and with the disposition of

[1] Ox., p. 361; Miles, pp. 52, and 294, 295.
[2] G. Hist., pp. 43–56; Hend, pp. 8–12.
[3] G. Hist., p. 57; Hend., p. 10.
[4] G. Hist., p. 69; Hend., pp. 12–15.
[5] G. Hist., pp. 289, 290; Hend., p. 15.
[6] G. Hist., p. 302; Hend., p. 15.
[7] Hend., p. 27.
[8] G. Hist., p. 101; Hend., p. 27.
[9] G. Hist., p. 116; Hend., p. 30.
[10] G. Hist., p. 317.
[11] Hend., p. 32; Duff., p. 53; G. Hist., p. 347.
[12] Hend., p. 34.
[13] Dill., p. 154.
[14] See Smith's *Discovery of America by the Northmen*: London, 1842; also Mackenzie, Henderson, Encyc. Brit.
[15] See, in general, G. Hist., by M. Marmier.
[16] Forbes, p. 69, and other authorities; see Trade.
[17] P. and Z., p. 479; G. Hist., p. 69; Hend., p. 12.
[18] P. and Z., p. 479; G. Hist., p. 373; Hend., p. 16.
[19] We use the word *shire* as the etymological equivalent of *sysla*, or *syssel*; but the average English shire has a hundred times the number of inhabitants of an Icelandic *sýsla*.
[20] P. and Z., pp. 479, 480; Hend., p. 16.
[21] See Appendix C, table No. 1.
[22] P. and Z., p. 480.
[23] Hend., p. 12.
[24] P. and Z., p. 480; G. Hist., p. 373; Hend., p. 16; Mck., p. 289.

the revenue, and, in time of war, assumes the title of governor general.[1] He is called (Dan.) *stiftamtmand*, or (Icel.) *stiptamtmadhr*, and is commonly a Danish nobleman, who, after spending five or six years in Iceland, returns to Copenhagen to solicit a better appointment.[2] Each shire has a sheriff, (Icel., *sýslumadhr*; Dan., *sysselmand*,) and each commune a mayor, (*hreppsmadhr* or *hreppstjóri*.)[3]

Besides these officers there is a treasurer or steward (Icel., *landfógeti*; Dan., *landfoged*,) who receives the taxes from the *sysselmänd* and delivers the proceeds to the *stiftamtmand*.[4] There is also a supreme court, which meets once a month at Reykjavík, consisting of a chief justice *(justitiarius)* and two assistant justices, *(ábyrgdharmadhr,)* with a clerk. Appeal lies from this court to the supreme court of Copenhagen.[5]

The *stiftamtmand*, the two subordinate *amtmänd*, the *landfoged*, the three justices, and the *sysselmänd*, receive their appointments directly from the Danish Crown; the district judges and the mayors of communes are appointed by the *stiftamtmand*.[6]

At the foundation of the republic the Icelanders established a general court or parliament, *(Althing,)* which met annually at Thingvellir, and held the supreme legislative and judicial power of the nation. This venerable assembly continued to exist till the year 1800, when it was abrogated by the Danish government.[7] The new *Althing*, which meets at Reykjavík, is only a consulting body.[8]

Iceland has one bishop, *(biskup,)* who lives at Reykjavík; and it is divided into provostships and parishes. The provosts *(prófastr)* and priests *(prestr.)* are subordinated to the provost and priest of the metropolitan church, and these latter directly to the bishop. All these offices are filled by government appointments.[9]

LANGUAGE AND LITERATURE.

The language of Iceland constitutes, with the Norwegian, the Swedish, and the Danish, the Scandinavian division of the Germanic branch of the Indo-European family. "The two Eddas, gathered or preserved to us from the 12th and 13th centuries, are, in virtue of their tone and content, by far the most primitive works in the whole circle of the Germanic literatures, documents of priceless value for the antiquity of the Germanic race. Their language, also, though of so much more recent date than the oldest Anglo-Saxon and High German, is not exceeded by either in respect to the primitiveness of its phonetic and grammatical form. Nor has it greatly changed during the six or seven centuries which have elapsed since the compilation of the Eddas. The modern Icelandic is still, among all the existing Germanic tongues, the one that has preserved and possesses the most of that original structure which once belonged to them all alike."[10]

The ancient literature of Iceland, dating from the latter part of the 11th century, is of great interest and value, both historic and poetic. Its most flourishing period, which closed at the middle of the 14th century, is marked by the compositions of the *skalds*, by the two *Eddas*, and by the *Sagas*. The Bible was translated into Icelandic in the 16th century. In later times Icelanders have paid a creditable attention to science. There is a literary society, founded

[1] P. and Z., pp. 480, 481; G. Hist. p. 373; Hend., p. 16.
[2] P. and Z., p. 482; G. Hist., p. 373; Dill., p 136; Mck., p. 288.
[3] P. and Z., p. 480; Hend., p. 16; Mck., p. 290.
[4] P. and Z., pp. 480, 481; Hend., p. 16.
[5] P. and Z., p. 480; Hend., p. 16; G. Hist., p. 375; Mck., p. 292.
[6] P. and Z., pp. 481, 482; G. Hist., p. 373.
[7] Hend., pp. 13, 16; G. Hist., pp. 69, 375; Mck., p. 293.
[8] Ox., p. 173; P. and Z., p. 51.
[9] P. and Z., p. 482.
[10] W. D. Whitney's *Language and the Science of Language*, p. 212.

in 1816, which has two branches—one at Copenhagen and one at Reykjavík. Its object is to diffuse a taste for literature and to promote the study of the ancient Icelandic writings. The publication of Olsen's map and of other valuable works is due to this society.[1] Modern Icelandic poetry has little original value.[2]

EDUCATION.

Domestic education is universal; every poor fisherman can read and write, and is familiar with the Bible and the Sagas.[3] Yet there was no elementary public school in Iceland till one was recently established at Reykjavík;[4] and till 1846 there was but one college, which was at Bessestadhir, designed principally to furnish an ecclesiastical education.[5] But in that year a gymnasium having a more general scope was established at Reykjavík.[6] Some of the young Icelanders finish their studies at the university of Copenhagen, where they enjoy certain privileges, and are generally distinguished by their devotion to study.[7] The degree of this university is requisite for appointment to political office under the Danish government.[8]

CRIME.

It is in large measure to their wide-spread home education that we must attribute the fine moral character of the Icelanders. The fact is, crime is almost unknown; there is little theft, debauchery, or cruelty, so that the old prison-house, finding no occupants, was turned into a mansion for the governor.[9] There are no soldiers and no police.[9] There used to be no trial by jury, but a sort of settlement by referees;[10] at present the malefactors are sent to Denmark for trial. In the parliamentary reports (Accounts and Papers, volume 47, for 1837–'38, page 255) we find "A statement of the number of persons arraigned and convicted, sentenced or acquitted, by the civil tribunals of Denmark proper, during the period of seven years, ending with 1834, in each of the provinces under-mentioned." For Iceland during these seven years there were but 292 indictments, of which 216 cases were convictions, 20 cases were in suspense, 32 cases were dismissed, and 56 were acquittals. Of these 216 convictions 79 were for "carnal offences," 86 were larceny, 15 were for transgression of the sanitary laws, 5 were for murder, and the rest various, such as false evidence, receiving stolen goods, &c. There was no technical robbery, no forgery, no vagrancy, no arson, and, notwithstanding that it was once a custom, which the "Oxonian" says[11] still exists, no exposure of new-born infants. The only common vice is drunkenness, which, Henderson notwithstanding,[12] certainly does exist among all classes, and is very common.[13]

A sort of superstition exists about a tribe of robbers who live in the desert centre of the island and carry off sheep. The only ground for this belief is the immense loss of sheep, which, however, could be accounted for in other ways.[14]

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[1] G. Litt., p. 268.
[2] G. Litt., by M. Marmier; Hend., pp. 22–24, 461–495, 513–563; Mck., pp. 19–34. The number of books published in 1847 and 1848 was 34. (Miles, p. 295.)
[3] G. Litt., pp. 263–267; Hend., p. 25; Porter's Prog. Nation, pp. 689, 690; P. and Z., p. 45.
[4] G. Méd., p. 187; G. Litt., p. 266.
[5] G. Litt., pp. 270–274.
[6] G. Méd., p. 187.
[7] G. Méd., p. 187; G. Litt., p. 274; Hend., p. 24.
[8] G. Litt., p. 275.
[9] Duff., pp. 54, 55; Ox, p. 198; Dill., p. 296; Mck., pp. 266, 267; Porter's Prog. Nation, p. 690; G., vol., II, pp. 22–24.
[10] Dill., p. 139.
[11] Ox., p. 70.
[12] Hend., p. 355.
[13] Ox., p. 385; Forbes, p. 312.
[14] Ox., p. 100; Forbes, chap. IX.

DISEASES.[1]

The commonest diseases are a certain variety of internal cysts, hysteria, and rheumatism. The island is entirely exempt from intermittent fevers, chlorosis, and syphilis, and almost entirely from all scrofulous diseases, (including consumption,) and from inflammation of the lungs. *Mania à potu* and caries of the teeth are also almost unknown. These facts are positively established, and are not explicable in any exact way. There is an equally remarkable liability to certain diseases, namely, the hydatic disease just mentioned, leprosy, lockjaw of infants, a species of insipid pyrosis, and neuralgia of the external part of the arm. The peculiar cyst disease of Iceland is exceedingly frequent, especially in the interior. Dr. Thorsteinssen, physician in chief of the island, holds that one-seventh of all the men are affected by it. The cysts affect especially the liver and lungs, but none of the softer organs and tissues are exempt. In severe cases it often proves fatal. The leprosy of Iceland is essentially the same as the elephantiasis of the Greeks, although it presents some peculiar features. It is not contagious, and is, no doubt, aggravated, if not superinduced, by the friction between the skin and the woollen cloths, neither of which receive all the advantage which they might from the thermal springs of the country. Leprosy is a disease which disappears as civilization advances. It was once common throughout northern Europe, but is now losing its hold upon its last strongholds. Lockjaw of infants is not unknown in any country, but in Iceland only is it a common disease. It is most frequent in the Vestmannaeyjar where no less than 64 per cent. of the children die between the fifth and twelfth days after birth! In other parts of Iceland it is the cause of many deaths. The death rate of children in Iceland is nearly twice that in Copenhagen. The other diseases peculiar to Iceland are of little importance. Scurvy is frequent. The island supports six physicians.

MONEY AND COINS.—BARTERING.

A cause of dissent among the Icelanders has always been the unjust manner in which the taxes are levied. Before describing this, we must give an idea of the money of the country. The circulating medium is Danish silver, without bank-notes or gold or copper.[2] The value of Danish money is thus stated in round numbers: 1 skilling=0*s* 0¼*d*=$0.005; 1 mark=16 skillings=$0 09; 1 Rigsbank dollar=6 marks=$0 55; 2 Rigsbank dollars=1 specie dollar=$1 10.[3] But transactions are more often carried on in butter, fish, and other articles.[4] In fact, government taxes are levied in hundreds of ells of cloth, or their equivalent. A regular balancing of equivalents has been established thus:[5] one ell of cloth is equal in value to one pound of butter, to one pound of tallow, to one pound of wool, to two fishes of 216 weight, to one-half pot of train oil; 100 ells of cloth is the same as six milking ewes or as one horse; a wether is valued at 20 ells of cloth; and a cow at 120 ells.

TAXES.

The chief state tax is the *scat*, a tax levied on the value of the farms.[5] The amount depends upon the number of *hundreds* at which a farm is set down in the old census.[6] A hundred is literally a hundred ells of cloth, or its equivalent. Dillon says[7] a hundred is any quantity of land which can support a horse, a cow, and six sheep. "Oxonian" judges[6] it to be about as much land as will support

[1] The facts on this subject have been derived from the admirable treatise published by the French government, (G. Méd.,) by M. Eugène Robert, Paris, 1851.
[2] Dill., p. 288.
[3] Murray, p. 90; Ox., p. 398.
[4] Dill., p. 95.
[5] Ox., p. 227; this is the latest scale. Another will be found G. Hist., p. 374.
[6] Ox., p. 227.
[7] Dill., p. 96.

a cow. Whether the amount has changed since Dillon's time, or whether the Oxonian's idea of the appetite of cattle is more liberal than Dillon's, or whether the amount is entirely irregular and uncertain, we do not know. It is enough here that a hundred is an amount of land having reference to its value as pasture. But the tax depends not only on this element, but also on the number of persons in the household. Thus, if a farm is set down at ten hundred, and has ten persons in it, the owner pays 20 ells; but if there are eleven persons in it he pays nothing. Such a tax is, of course, easily evaded. Priests and government officers are exempted from any tax.

PROPERTY.

Land is held either in fee simple or let by the Crown to tenants on what may be almost considered perpetual leases.[1] No property can be entailed, and if any one dies intestate, what he leaves is distributed equally among his children; whole shares to sons, half shares to daughters.[1]

The system of taxation is certainly bad for the governed. It appears to be equally so for the government. At present Iceland is by no means self-supporting.[1] The whole revenue amounts to about $15,000; the expenditure for education, salaries of officers, and ecclesiastical establishments, is more than twice this sum.[1]

It cannot be supposed that such a state of affairs is necessary. A slight examination gives the assurance that, were the natural resources of the country intelligently developed, a new financial prosperity would create itself, and that the at present pauper Iceland would pay to government a rich revenue in return for the capital and pains-taking it laid out.

COMPLAINTS.

The Icelanders are, as we have said, attached to their country by an intense patriotism. Yet we find frequent complaints of the manner in which the Danish government has maltreated or neglected them. Miles found[2] many Icelanders looking to America with the hope that she would send settlers to their shores to teach them the productive and practical arts. The "Oxonian" observes[3] a strong feeling against the mother country, especially among the Northerners,[4] whom he thinks the finest of the Icelanders.[3] They wish, says he,[3] quoting from an intelligent pastor, who seems to be an Icelander to the backbone, and a hater of the southern half-Danes, "a legislative assembly, with a veto reserved to the king; not as now a mere consulting and advising body." And then he goes on to say, "What the people would like would be to be joined to Norway. The ancient Iceland I am proud of, the modern I almost pity." This is from an Icelandic ultra-liberal, but the general tone of the more intelligent people everywhere shows that, though they firmly believe their island "the best the sun shines upon," it is so, rather from its natural position and climate and from its undeveloped resources than from what the government and human exertion has made it. They look forward to a glorious future, when a free and enterprising government shall aid them with capital and energy to explore their country's wealth, and give them the honorable position among nations which they ought to hold.[5]

PURSUITS OF THE PEOPLE.

At present all the energy of this fine people is devoted to the simplest pursuits of domestic life. Their existence is monotonous enough. "Spring is devoted to fishing, summer to cutting turf and making hay, autumn to building, manuring, and to slaughtering and curing the sheep. The women wash, card,

[1] Duff., pp. 141, 142.
[2] Miles, p. 298.
[3] Ox., pp. 173, 174.
[4] Ox., p. 361.
[5] See also Hooker, vol. II., pp. 62, 63.

spin, knit, and weave."[1] Little is cultivated except what is required for the animals. Other occupations are hunting birds, collecting drift-wood, collecting Iceland moss, making fishing-tackle, &c., making clothes.[2] Von Troil[3] makes the following statements, some of which are not supported by other testimony:

The men likewise prepare leather, for which they use maid-urt (*spiraca ulmoria*) instead of birch-rind. Some few work in gold and silver, and others are instructed in mechanics, in which they are tolerable proficients. * * * * Their work is in some measure determined by their *bya-lag*, or by-laws of their villages, in which the quantity of work they are bound to perform in a day is prescribed to them. They seldom do so much work now, so that it is called only *medelman's vark*, or the work of a man of middling strength. According to this prescription a man is to mow as much hay in one day as grows on 30 fathoms square of manured soil, or 40 fathoms square of land not manured, or he is obliged to dig seven hundred pieces of turf, eight feet long and three broad. If so much snow falls as to reach to the horses' bellies, which they call *quadsnêe*, he is to clear away daily the snow for a hundred sheep. A woman is to rake together as much hay as three men can mow, or weave three yards of wadmal a day.

The principal article of food is dried cod-fish, which is eaten without being cooked. Next in importance comes *skyr*, an imperfectly made cheese, which is eaten sour half the year. Butter, mostly rancid, is consumed in large quantities. Bread and vegetables are very little used. Meat is eaten not more than once a week; except in the months of September and October, it is not eaten fresh, but salted and smoked at once. Horse-meat is occasionally used. The Icelanders mostly eat their food cold, and use salt very little.[4] Snuff is taken largely; tobacco in other forms less.

DETAILS OF GEOGRAPHY.

It is necessary, now, to enter with more detail into a description of the populous parts of Iceland to serve as a preface to the discussion of the agricultural, fishing, and mineral resources of the several districts. We have said that the coasts alone were the inhabited parts. Of these the western and northern coasts are the better known and the more populous, since they have better harbors and better soils than the eastern and southern parts.[5] We will now take the map and follow round the coast line, beginning with the capital and principal port, Reikiavik.

Reykjavík.—Reykjavík is in latitude 64° 8′ 40″ north, longitude 21° 50′ west.[6] Its population was 1,149 in 1850, and 1,354 in 1855, and, at this rate of increase, ought to be 2,000 at the present time.[7][8] Here the commerce of the southern and western coasts centre, and here arrives the steamer from Copenhagen. The harbor seems to be a good one. The town is built on a narrow flat between two low hills, having the sea on the northeast and a small lake on the southwest side.[9] It has been suggested that by widening the stream which connects this lake with the sea, it might be easily converted into a valuable basin for shipping.[10] The town itself consists of a collection of wooden houses one story high, built along the lava beach, and flanked at either end by a suburb of turf huts.[11] There are 16 or 17 merchants' establishments,[12] an observatory,[13] a library,[8] a stone church,[13] and a governor's house in stone,[13] (formerly the house of correction.)

The college, once at Reykjavík, has been removed to Bessestadhir,[14] which is to the southeast of Reykjavík, situated on the edge of the lava region.[15] This col-

[1] Duff., p. 141.
[2] G. Med., p. 143, *et sqq.*; Thaarup, p. 378.
[3] V. T., p. 658.
[4] G. Med., p. 140. Von Troil (p. 655, *et sqq.*) and others mention many other articles of food, but the above are the chief staples. Icelandic dinner-parties are described by Dufferin and Hooker. (vol. I, p. 67.)
[5] Miles, p. 315.
[6] Lipp., p. 888.
[7] Meddel., vol. IV, p. 3.
[8] G. Hist., p. 267.
[9] Mck., p. 79.
[10] Dill., p. 91.
[11] Duff., p. 46.
[12] Dill., p. 286.
[13] Hend., p. 44.
[14] G. Hist., p. 270.
[15] Mck., p. 168.

lege is chiefly ecclesiastical. A gymnasium of a more general scope was established, in 1846, at Reykjavík.

Gullbríngu Sýsla.—The tongue of land south of Faxa Fjördhr, Gullbríngu Sýsla, may, one of these days, have a vast importance as the reservoir of quantities of sulphur. There are some small towns there, notably: Hafnarfjördhr, Njardhvík, Keflavík, and Krísuvík, which would, in that case, become important. The whole coast is more dreary and barren than any other part of the island,[1] green patches existing only here and there, and its only inducement for settlement has so far been the vast numbers of fish obtained in the neighboring seas.[1]

Hafnarfjördhr consisted, in 1834, of four timber dwellings and several wooden warehouses, together with 40 or 50 little Icelandic cottages.[2] It is upon a snug bay, where there is good anchorage, and there is an inner harbor where sloops of respectable tonnage can be easily brought in for repair.[3] It is a great fishing depot, and during the spring becomes populous with fishermen.[4] Indications of the sulphur mines of Krísuvík are here seen. Forbes speaks of 20 tons of flour of sulphur stored there ready for sale and exportation.[4] Should these mines ever come to anything the sheltered bay of Hafnarfjördhr will have a great value.

Njardhvík is a large fishing village a little to the east of Keflavík. It is much frequented by the inhabitants of the interior, who come down to the sea to procure fish. Three hundred boats belong to this place, and the population of 200 swells to 2,000 during the fishing season. The fish here are esteemed finer than at any other part of the coast.[5]

Keflavík is an open roadstead for shipping, much exposed.[6] The fishing is good. Mackenzie says[5] the bay is small, but affords good anchorage. On the extreme point of this lava peninsula[7] is the factory of Kirkjuvogr, the most southerly harbor on the east coast, and one of the safest harbors in Iceland.[8] "The trade," says Henderson,[8] "is considerable."

On the southern coast of the peninsula is Krísuvík, which is situated near the sulphur mountains,[9] and 30 miles from Reykjavík.[10] It is not a very flourishing place; contains a church and but one farm-house.[11] Near by are some good pasturages, but in general the country is rugged and sulphurous.[12] We shall have occasion to speak of this region when we discuss the mineral resources of the country.

Thingvalla.—By penetrating somewhat into the interior we come to the celebrated Thingvalla, situate 40 miles from Reykjavík. This was once the seat of the Althing, or General Court,[13] where were enacted many of the romantic episodes in the history of Iceland.[14] Thingvalla is the name of a lake and valley. Thingvalla vatn is "a glorious expanse of water,"[15] nearly 30 miles in circumference,[16] and more than 10 miles long.[17] The plain of Thingvalla is a lava tract[18] covered with birch brush wood in part,[19] and described as more wonderful than the Geysirs.[18] The parish here is now small enough, consisting of but 12 families.[13] The lake is very deep—in some places 100 fathoms,[16] and is the largest sheet of water in the country.

Rángárvalla.—And now we come to some of the most fertile and best watered parts of the land. First, Laugardalr is described as a "beautiful green,"[20] fertile and extensive, ornamented by two broad lakes and numerous rivers.[21]

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[1] Mck., p. 125; P. and Z., pp. 66-68.
[2] Dill., pp. 16, 17.
[3] Forbes, p. 101; Mck., p. 98; Miles, p. 213; Dill., pp. 16, 17.
[4] Forbes, p. 101.
[5] Mck., p. 122.
[6] Dill., p. 280.
[7] Dill., p. 279.
[8] Hend., p. 182.
[9] Hend., p. 454.
[10] Forbes, p. 100.
[11] Miles, p. 200.
[12] Forbes, p. 105.
[13] Hend., pp. 58. 59.
[14] See the entertaining book, "*The Story of Burnt Njal.*"
[15] Duff., p. 104.
[16] Forbes, pp. 76, 77.
[17] Miles, p. 72.
[18] Duff., p. 84.
[19] Duff., p. 91.
[20] Hend., p. 62.
[21] Forbes, p. 230.

Then comes the fine stretch of country east of Thingvalla, where Skálholt, formerly considered as the capital of Iceland,[1] is situated. All this is a fine meadow, land watered by the grand stream the Hvítá.[2] The borders of the Thorsá is a magnificent grass country,[3] and there are numerous fine farms on the Laxá.[4] All this region forms the largest tract of fine grass in all Iceland.[5] It extends in a southerly direction[6] to the coast, and along the coast to Höfdhabrekka is well inhabited.[7]

Eyrarbakki is a small town with a dangerous harbor.[8]

Vestmannaeyjar, or Westmen islands.—Opposite the mouth of the Markarfljót are the Vestmannaeyjar only one of which—Heimaey, or Home island—is inhabited.[9] These islands are most difficult of approach, and in winter all access is impossible.[9] They are the chief seat of the strange lock-jaw of new-born infants. The trade of these isles is quite large. It consists of fish and feathers.[10]

In going north from Reykjavík on the western coast, we come to the Borgarfjördhr, with the town Innri Hólmr and others. All this country about the fiord has a fine reputation for morass pasture land, affording a rich supply of grass.[11]

Borgarfjardhar Sýsla.—Innri Hólmr is, on the whole, a very pleasant place. The pastures about it are good, and it is one of the numerous localities for eider down, about 40 pounds being annually obtained from an island near by.[12]

Snæfellsness Sýsla.—Further north is Snæfellsness Sýsla, with comparatively a thick population.[13]

Olafsvík, situated on a small but verdant tongue of land, is one of the ports here, but it forms only an indifferent roadstead.[14] Grundarfjördhr is near by, on a green flat.[15] Stykkishólmr was once a place of considerable traffic before the war between England and Denmark.[16] It has two merchants' establishments.[17] The fishery is very productive.[16]

Breidhifjördhr.—North of this peninsula, whose chief natural characteristic is the lofty Snæfells jökull at its extremity, is Breidhifjördhr, thick with islands, as many as 150 being crowded into the bay,[18] all of which are utilized for seal-fishing, sheep-feeding, and for getting eider down.[19]

Vatnahjallavegr.—Meanwhile the interior of the west country is barren and desolate, a lava desert, where no blade of grass exists[20] all the way from Haukadalr to Eyjafjördhr[21] in the north. From Skálholt to the north coast, the easiest route touches Hólar, which seems to be a lonely oasis beautifully situated,[22] after having traversed the valley between Hofs and Lóng jökulls, terminating at last at Eyjafjördhr.

Northern coast.—The greatest proportion of the Nordland is the property of the farmers who occupy it. Some of it belongs to the church, and part to the Crown. The population is confined to the shores of the fiords.[23] Throughout the whole of this inhabited region the pastures are good, but not so rich as those of Borgarfjördhr and some of the other parts of the south.[24]

Skagaströnd is one of the most considerable places of trade on the northern coast, but the harbor is not very good. The same may be said of Hofsós, also a trading town.[24]

The valley of Eyjafjördhr is well inhabited, being covered with luxuriant verdure, and affording excellent pasturage to the cattle, and especially to the sheep,[25] which form the principal riches of the Iceland peasant.[26] The high mountains are covered half way up with grass.[26] The cottages are better built than in the south, and there is a greater air of prosperity and civilization[26] than in the southern towns.

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[1] Mck., p. 209.
[2] Miles, p. 115.
[3] Miles, p. 161.
[4] Miles, p. 124.
[5] Mck., p. 235.
[6] Ólsen's Map.
[7] Hend., p. 258.
[8] Hend., p. 269.
[9] Miles, pp. 162, 163; Hend. p. 259.
[10] Hend., p. 259.
[11] Mck., p. 155.
[12] Mck., p. 148.
[13] See table, appendix B.
[14] Forbes, p. 194.
[15] Mck., p. 184.
[16] Mck., p. 186.
[17] Hend., p. 337.
[18] Mck., p. 185.
[19] Ox., p. 276.
[20] Forbes, p. 144.
[21] Hend., p. 79.
[22] Hend., p. 112.
[23] Mck., p. 231.
[24] Mck., p. 233.
[25] Mck., p. 232, 233.
[26] Hend., p. 70.

The harbor of Eyjafjördhr is the best on the northern coast.[1] Akreyri has three merchants' houses and 18 or 20 storehouses. The trade is wool, salted mutton, and other Iceland articles, which are exchanged chiefly for rye.[2] Near this place was once a fine forest, of which the stumps are still visible.[3] At Húsavík the fishery is not good, but during the winter many seals are caught.[4] Here there is, or used to be, a sulphur manufactory,[5] built as the appendix to the mines of Krafla. The harbor is one of the most dangerous in the island, not only on account of the rocks at its entrance, but also from the quantities of ice which, during certain seasons, drift in from Greenland.[5] The town is upon a precipice, 100 feet above the sea level, and articles are removed to and from ships by a crane placed on the brow of the height.[5]

Northeast desert.—Fljótsdalshèradh —The course from Húsavík to the eastern coast seems to be[6] by the way of Reykjahlidh and Krafla, where are the most extensive sulphur deposits of the island,[7] and a remarkable mountain of obsidian.[8] Near by is Myvatn, the second largest sheet of water in Iceland, remarkable as being fed in part by hot springs.[9] It is forty miles in circumference.[9] After having passed this region the traveller finds again a desolate lava-desert[10] till he reaches the Lagarfljót, excepting the thin strips of green on the river borders. Mrs. Somerville speaks[11] of the eastern coast as being the most favored portion of the island. Lagarfljót is certainly one of the finest tracts in all Iceland. On both its shores it is closely inhabited, containing 10 parishes, going under the common name of the Herved.[12] The pasturage is uncommonly rich, the meadows extensive; the mountains abound in Iceland moss, and the waters swarm with fine fish.[12] North of this blest region there seem to be but one or two settlements. At Vopnafjördhr there is a harbor, but it is inferior to some others in Iceland.[13] South the country seems to be more inviting, with some good pastures and facilities for fishing, till all fertility and settlements are cut off by the doleful and haggard tracts[14] near the Öræfa jökull, the highest peak on the island, and the front of the vast desolation of the interior. Hnappavellir is a swampy, sloping coast.[15]

RESOURCES.

VEGETABLE PRODUCTION.—FLORA.—FUEL.—DRIFT-WOOD.—LIGNITE.

The vegetable wealth of Iceland is not large. Owing partly to the soil, partly to the uncertainty of the climate, and also to the inactivity and prejudices of the natives,[16] grain is not produced. Berghaus places the island north of the northern limit of barley. He says that there are 407 species of non-cryptogamous plants on the island, of which one eighth are leguminous, one-eighteenth nearly are cruciferous, one-seventeenth are composite, one-ninth are cyperatiæ, and one-eighth are grain-bearing. The Iceland flora is nearly identical, says Sir John Herschel in his Physical Geography, with that of the Scandinavian mountains.[17] That an utter poverty in the breadstuffs has always characterized the country is by no means evident, since the ancient books and legends speak of flourishing crops of grain,[18] and all the authorities agree that the fertility of the soil was once greater than it is now. The grass country certainly was once more extensive than it is now,[19] and where at the present time only stunted

[1] Mck., pp. 222, 233.
[2] Hend., p. 92.
[3] Hend., p. 117.
[4] Mck., p. 233.
[5] Hend., p. 128.
[6] Course of Henderson.
[7] Hend., p. 147.
[8] Hend., p. 156.
[9] Ox., p. 135.
[10] Hend., p. 164.
[11] Som., p. 164.
[12] Hend., p. 173.
[13] Hend., p. 167.
[14] Hend., p. 204.
[15] Hend., p. 207.
[16] Mck., p. 281, and others; see further on.
[17] For the flora see P. and Z., p. 352, and H., vol. II, p. 311; also Mck., p. 409.
[18] Ox., p. 363.
[19] Forbes, p. 281.

birches or old tree-stumps[1] are to be found, forests of timber once abounded.[2] Now-a-days building-wood is absolutely wanting. Birch bushes seldom average above six feet in height,[3] the northern part of Iceland being the extreme northern limit of this tree.[4] A tolerably tall tree excites the remark of the traveller. Those, fifteen feet high, that Dillon saw,[5] were monsters. We are told of other small forests, one of trees averaging twenty feet in the valley of Lagarfljót,[6] and a large tract of land in the north called the Birch-thicket, and one of eight-foot birches near the White river (Hvítá.[7]) Besides the birch, the willow, the juniper,[6] the alchemilla, and the wild geranium are to be seen. From the latter the natives used to make a blue dye, called Odin's color.[8] This want of indigenous wood is in a great measure supplied by turf[9] and by the quantities of floating timber which are thrown upon the coasts,[10] so that many shore places otherwise of small value sell high on this account.[11]

Drift-wood.—Besides the Gulf Stream bringing a rich supply to the south, the current from north Asia throws drifting wood on the northern coasts of Iceland.[12] These two currents seem to have been ordained to compensate for the nakedness of the land and to furnish the natives with material for burning and for house and boat building.

The accumulated drift of the seas during past ages, too, have remained stored upon the shores, especially on the northwest peninsula[12] By exposure, by time, and by pressure, it has become a sort of lignite or surturbrand. Where it crops out as on the fiords of the northwest, or where it has been mined,[13] it is seen that it exists in three layers,[12] alternating with traps, each bed being three or four inches thick.[13] It is black and shiny like pitch-coal,[14] and contains fossil flora, an argument to some geologists that it is the result of a regular deposit similar to that which created the coal of the carboniferous period.[13 14] It is much to be regretted that we have no accounts to guide us in judging of the extent of these beds, nor recorded experiments as to the nature and calorific power of the combustible. We may be sure, however, that if the natural intelligence of the natives should be guided in their exploration by the skill of energetic practical miners, something could be made of these coal-seams. We shall recur again to this subject in speaking of the mineral wealth of the country.

Grass.—The grass lands of the Icelanders (with their superb fishing grounds) are their greatest wealth, as they pasture the flocks of sheep and cattle, which form their chief means of subsistence and their most important article of commerce. The meadow-lands are not ploughed and seeded down, but get grassed over by nature.[15] There is not a plough or a harrow in the whole country.[15] Dillon, however, speaks[16] of the grass crop being "*sown*" in May, going on to say that it begins to grow in June, and is fit for mowing in August.[17] At this latter season the fishermen migrate to the grass to help in mowing and stacking it.[17] The soil, says Miles,[18] is very fertile indeed, and the meadows look like fine pastures, where nothing has been for six weeks. The grass is thick and soft, much like our red-top.[19] White clover grows here very well. Indeed, on the Laxá river it is found spontaneously growing with caraway.[20] In the valley of the Laugardalr the soil is so rich that the ponies wade up to their knees in a sea of tall grass, which forms the rich, lawn-like meadows.[21] The hay from the Iceland grass is said to be exceedingly sweet.[22] With proper care, draining, and so forth, much of the land now covered with heath (nearly half of Iceland) could be made fertile enough for capital grazing land.[23] The Icelanders com-

[1] Hend., p. 117.
[2] Hend., p. 6.
[3] Forbes, p. 26.
[4] Berghaus's Atlas.
[5] Dill., p. 201.
[6] Som., p. 164; Hend., p. 173.
[7] Forbes, p. 144.
[8] Ox., p. 138.
[9] G., vol. II, p. 27.
[10] Hend., p. 6; Forbes, p. 26.
[11] Hend., p. 379.
[12] Forbes, p. 191.
[13] Lipp., p. 888.
[14] Duff., p. 186; Ox., p. 251.
[15] Miles, p. 125.
[16] Dill., p. 125.
[17] See Holland, p. 12.
[18] Miles, p. 116.
[19] Forbes, p 330.
[20] Miles, p. 125.
[21] Forbes, p. 232.
[22] Miles, p. 213.
[23] Miles, p. 158, and Dill., p. 100.

plain of the neglect shown by the Danish government in this as in other matters.[1] Some of the more sanguine of the agriculturists believe that grain even could be grown in Iceland,[2] were the soil, naturally excellent,[3] properly prepared by draining and ploughing.[4] To be sure the objection is made that the weather would prevent the ripening;[3] to be sure the sorry experiment made a few years with seed-corn proved an utter failure,[5] (from one quarter of a barrel of seed-corn but one-half a barrel was produced;) still we must be permitted to ask obstinately what the legends of grain grown mean,[6] and to suggest that the natives seem to be resolved, willy-nilly, that grain *shall not* grow in Iceland.

Potatoes and turnips.—At any rate there are some parts of Iceland where potatoes and turnips would grow, especially along the shores, where the soil is sandy and sea-weeds are abundant.[5] Indeed, already at Reykjavík, potatoes grow well, turnips look finely, and beds of lettuce are to be found in all gardens.[7] Even in the north, at Akreyri, Henderson tells us of gardens producing potatoes and colerope.[8] Dillon, on the other hand, calls Miles's potatoes and turnips mere pigmies,[9] but acknowledges[10] that much might be done were the cost of beginning disregarded. All that is wanted, says Mackenzie,[5] is some active and intelligent person, able to combat the prejudices and stimulate the exertions of the natives, to give a new impetus to agriculture.

Iceland moss.—The other vegetable products of Iceland of any importance are the Iceland moss, ("an article of commerce,"[11]) and other lichens, especially the reindeer's food, a kind of moss, which is very abundant;[12] then there is a sort of fiall grass,[13] which is used for making gruel, and finally a small blue berry, the only Icelandic fruit.[14] [15]

The effect of the introduction of foreign enterprise and capital upon the agriculture of Iceland is appreciated by all writers. The grass would be improved,[14] the pastures increased in size, vegetables would be introduced, and with them the benefits of an anti-scurvy food upon the general health of the island; fruits would perhaps find their way in, and a genuine agricultural progress would be inaugurated, with unspeakable benefit to the island and its inhabitants.

DOMESTIC ANIMALS.

The domestic animals of Iceland are sheep, cattle, and horses;[16] goats are found in the north.[17] The pig in such a country is too expensive to rear.[17] Dogs and cats are found.[17]

Sheep.—The number of sheep in Iceland is about ten times the human population, 600,000.[18] These immense flocks are the chief support of the people; they furnish them with food and raiment, as well as with an industry and articles of commerce. The Iceland sheep has sometimes four or even six horns;[19] they are larger than the old Scotch breed.[20] The wool is coarse, but is long and soft, and contains a fibre (tog) which resembles camel's hair.[21] It is woven up into stockings and mittens by the women, and is exported thus made up, or in a raw state. The mutton, salted down, is one of the most valuable staples of com-

[1] Forbes, p. 160.
[2] Hend., p. 7.
[3] Dill., p. 109.
[4] Miles, pp. 304, 305.
[5] Mck., p. 281.
[6] Yet perhaps these legends have something of that tendency of the Icelanders to tint everything connected with their land in *couleur de rose*, which alone will account for a modern poem (H., vol. I, p. 39) called *The Georgics of Iceland*.
[7] Miles, p. 62.
[8] Hend., p. 92.
[9] Dill., pp. 82 and 109.
[10] Dill., p. 281.
[11] Lipp., p. 888.
[12] Mck., p. 350.
[13] Dill., p. 82.
[14] Miles, pp. 157, 303.
[15] For an extended description of the plants, see Mck. and Ox.
[16] Miles, p. 55; Dill., p. 289.
[17] Dill, p. 289.
[18] Lipp., p. 888; in 1845 there were 617,401; G. Méd., p. 177; Miles, p. 55.
[19] Dill., p. 291.
[20] Mck., p. 278.
[21] Ox., p. 249.

merce. The improvement of the breed, and thus of the quality of the wool, is a subject often agitated by the writers, adding another to the long list of instances where the travellers seem struck with the richness of natural resources in the country, and the neglect of man there to improve and develop them.

Cattle.—The cattle of Iceland are generally devoid of horns.[1] Perhaps this is why the official statistics, with a sort of grim humor, number the "*horned* cattle" at 23,713,[2] while other authorities say there are 40,000 "cattle."[3] They are, says Mackenzie,[4] very like the largest Highland breed. The cows yield much milk, many of them 10 or 12 quarts a day, and some more.

Horses.—The census of 1845 gave 34,584 horses.[2] In the uninhabited parts many troops of wild horses are to be found, which shift for themselves even in the severest winters, when they perish in large numbers.[5] Miles says there are in all 60,000 horses,[3] and Lippincott counts but 20,000.[6] The breed is an excellent one; they are a little larger than Shetland ponies, that is, twelve or thirteen hands high.[7] They are stout, strong, hardy, and sagacious;[8] they are sleek and fat, but have long hair and flowing tails.[9] They are seldom seen covered with sweat, and will travel, well laden, 10 or 12 hours a day, without rest, for several successive days.[10] They are remarkable for their scent.[11] They thrive very well with only a rude sort of keeping, never receive bran or oats, and in winter eat even sea-weed and fish. The white horses are most esteemed; the black least.[10] The best breed of ponies comes from Borgarfjördhr.[12] Their value increases with their age.[13] A horse bringing $150 or $200 in Boston or New York, sells for $10 in Iceland.[9] A first-rate riding horse, sure-footed, well-bred, and handsome, costs $25 and upwards.[14] There is quite an extensive exportation of horses to Scotland and England,[15] and it has been suggested[15] that the same stock, thus sent to improve certain English breeds, might be well worth adding to American.

Dogs.—The dogs of Iceland resemble the Greenland variety.[16] They are used for guarding the sheep.[17]

STATISTICS ON SHEEP, CATTLE, AND HORSES.

A few statistics, even if they are repeated in the latter part of this paper and in the tables of our appendix, having special reference to the wealth of Iceland in sheep, cattle, and horses, will not be out of place.

Proportion of animals in Iceland in 1804.[18]

Cows	15,595
Heifers	1,556
Bulls and oxen	1,132
Calves	2,042
Cattle, total	20,325
Milch ewes	102,305
Rams and wethers	49,527
Lambs	66,986
Sheep, total	218,818
Number of horses	26,524

[1] Dill., p. 290; Mck., pp. 276, 277; v. T., p. 663.
[2] Lipp., p. 888; G. Med., p. 177.
[3] Miles, p. 55.
[4] Mck., pp. 276, 277.
[5] Forbes, p. 227.
[6] Lipp., p. 888.
[7] Miles, p. 55; Mck., p. 340; Hend., p. 49.
[8] Dill., p. 290; Hend., p. 49.
[9] Miles, p. 129.
[10] G. Med., p. 153.
[11] Dill., p. 290.
[12] Forbes, p. 115; Ox., p. 318.
[13] Forbes, p. 83.
[14] Hend., p. 49; Ox., p. 48.
[15] Miles, p. 299.
[16] Mck., p. 337.
[17] Dill., pp. 111 and 291.
[18] Mck., see Appendix D.

Exports from Iceland in 1806.[1]

Wool, given approximately	250,000 pounds
Yarn, in English pounds	9,000 pounds.
Stockings	181,676 pairs.
Mittens	283,076 pairs.
Lamb skins	7,427
Salted sheep skins	32,803
Tallow	200,000 pounds.

Exported from Iceland to Great Britain alone in 1864:[2] horses, 470; value, £2,468. With Denmark, wool, 2,229,504 pounds; value, £119,748. In 1861–'62–'63–'64 the number of horses imported by Great Britain from Iceland has been, respectively, 444, 856, 345, and 470. During the same years the exports of wool from Denmark, Iceland, Greenland, &c., to Great Britain were, in value, £45,947, £80,747, £89,394, £119,748.

HUNTING.

The list of wild mammalia in Iceland is not long.[3] It includes the polar bear in small numbers, as visitors rather than as indigenous, being brought from Greenland on the floating ice,[4] the white and blue foxes,[3] the reindeer, seals of four different kinds, numerous sea animals of the porpoise family, and whales. There is no important hunting, unless it is for seals and whales, which forms quite an industry in some places. The foxes are troublesome, as committing great depredations among the sheep.[5] The reindeer, too, interfered with the sheep, so that they were killed off by the farmers till few, if any, remain.[6] They were introduced long ago from Lapland,[6] increased wonderfully in numbers, large herds[7] being seen from time to time in the interior, but now they are scarcely ever seen.[6] There are no indigenous quadrupeds.[8]

BIRDS.—EIDER DUCK.—FEATHERS.—GAME.

There are numerous kinds and countless numbers of birds in Iceland. Miles devotes a large space in his book to their description, (see Miles, pages 218 to 232.) He mentions the cormorant, solan goose, snow-bird, gulls, owls, jer-falcon; and then the game birds, ptarmigans, curlew, plover, and tern.[9] But by far the most valuable of all the country's fowls is the eider duck.[10] In late spring[11] these birds make their appearance in Borgarfjödhr,[12] in Faxafjördhr and other favorable spots, and build their nests and breed. Vidhey and Engey, north of Reykjavík, swarm with them,[11] these two islands giving an annual produce of 300 pounds.[13] There are still more in the myriad islands of the Breidhafjördhr.[13] The down is taken from the nest with the eggs; whereupon the duck lines the nest again, and lays more eggs. This is often repeated twice.[14] Unpurified down is worth from 23 sk. to 1 Rd. 75 sk. a pound; purified from 2 Rd. 66 sk. to 4 Rd. 53 sk.[14] Three nests give a half a pound of down.[13] In some places the ducks have been frightened away by the cannon of cruisers sent to protect the fishermen.[15] In 1806 there was about 2,000 pounds of eider down exported from Iceland.[1]

Besides the down there is quite a trade in feathers. On the Vestmannaeyjar the people are especially indebted to the puffin for their means of subsist-

[1] See Appendix E.
[2] Parliamentary Reports, 1865; LII, p. 55.
[3] Dill., p. 292; Hend., p. 357; Mck., p. 337; Miles, p. 170.
[4] Mck., p. 337; Forbes, p. 40.
[5] Hend., p. 357; Forbes, p. 227; Mck., p. 337.
[6] Forbes, p. 327.
[7] Dill., p. 85; Lipp., p. 888; Miles, p. 110; Mck., p. 338; Miles, p. 170; Hend., p. 270.
[8] H., vol. 1, p. 52.
[9] Miles, p. 57.
[10] Lipp, p. 888.
[11] Dill., p. 257.
[12] Forbes, p. 118.
[13] Dill., p. 264
[14] P. and Z., pp. 53, *et sqq.*; H., I, 42, 63; II., 361.
[15] Hend., p. 184.

ence. Countless myriads of these quaint birds dwell in the rocks of these islets. Their feathers are exported, while their bodies are used for food, either fresh or salt, and when plentiful, for fuel.[1] Other birds supply feathers for exportation. In 1866 upwards of 8,000 pounds of feathers were sent away.[2]

There seems to be an abundance of game-birds in the island. Ptarmigans of two kinds[3] are very abundant,[4] and thousands of golden plover are found near Thingvallavatn.[5] In a five days' excursion Forbes shot 600 head of snipe, ptarmigan, and plover, near the latter place.[6]

FISHERIES.

As we have before said, one of the most important industries of the Icelanders is the fishing. Varied and extensive as it is, and depending upon a peculiar character of people, it has determined more than anything else the modes of their existence, and is the inspiration of their national life. The lakes and rivers abound in salmon and trout,[7] while their bays and fiords swarm with enormous numbers of cod and haddock, as well as numerous seals and sharks.

Cod.—The most lucrative and the most important of the fisheries is the cod fishery, which seems at present to be monopolized by the French government.[8] There is no part of the world where cod fishing can be so extensive or so easily carried on as in Iceland.[9] Even in the inner harbors cod are taken,[10] and the island's coast seems in every way cut out for a fishing station.

The fishing season lasts from the first of February to the first of May,[11] during which period the inhabitants flock in vast numbers to the coasts and to the fishing grounds to pay the labor which the fishermen render them in summer time in the fields. Small factories and hamlets become populous at this time,[12] and the whole energy and interest of the island is turned to this its characteristic occupation. It is principally along the western shores that the cod are fished.[13] Breidhafjördbr and Faxafjördhr are favored seas, but the most productive region is off the southern coast of Gullbríngu Sýsla from Keflavík to Hafnarfjördhr.[14] It is a noteworthy fact that this desolate peninsula is in appearance the most doleful part of Iceland, excepting the jökull region of the southwest, yet it really is one of the richest districts of all, containing, as it does, a splendid wealth of sulphur, and being girded with such magnificent fishing waters. We have said that the French monopolized the cod fishery. This was not always the case. In the reign of James I, of England, no less than 150 British vessels were employed in these fisheries.[13] Little by little France, by patient but strenuous effort, established a foothold on, and afterwards a monopoly of, the Iceland cod fishery, thus securing for herself, as she did in Newfoundland, not only a source of national wealth, but a powerful reserve of experienced seamen.[15] This latter advantage must not be too lightly regarded, for it is certain that no better school for sailors could be imagined than the dangerous and adventurous navigation of the fiords of Iceland. In 1860 there were 269 French vessels, varying from 40 to 80 tons burden, and 7,000 fishermen engaged in cod catching.[8] Of these men the larger part have served their appointed time in men-of-war, and enter the fishing service to make money, as the bounties are liberal and the fortune almost always excellent.[8] These fisheries are protected by men-of-war,[16] which cruise about, giving the fishing-smacks assistance in men, spars, provisions, or medical aid.[17] Forbes says[17] that no such powerful reserve of trained seamen exists, except those engaged in a similar occupation and under similar regulations on the banks of Newfoundland; and Forbes is a commander in the royal

[1] Forbes, p. 31; Dill., p. 293.
[2] See Appendix E.
[3] Ox., p. 83.
[4] Dill., p. 85.
[5] Forbes, p. 75.
[6] Forbes, p. 99.
[7] Miles, p. 54.
[8] Forbes, p. 207.
[9] H., vol. I., p. 87.
[10] Mck., p. 286.
[11] Hend., p. 279; Mck., p. 344; Miles, p. 54; Duff., p. 140.
[12] Mck., p. 122.
[13] Mck., p. 344.
[14] Dill., p. 173.
[15] Forbes, p. 217.
[16] Forbes, p. 36.
[17] Forbes, p. 208.

navy, whose opinion on this point is worth something. The codfish caught is dried, salted, and sent in great part to northern Europe, to Spain, and to the Mediterranean, where they are purchased in large quantities for the use of the Catholics during Lent.[1]

Salmon.—The salmon fishery of Iceland is in the hands of the Scotch,[2] but is in not so advanced a state as the cod fisheries. Yet the salmon are to be found in vast numbers[3] in all the rivers and lakes, especially in those which flow into Borgarfjördhr.[4] Near the river Hvítá Forbes visited[5] an establishment belonging to Messrs. Ritchie of Peterhead, where nine Scotchmen were engaged in preserving the salmon collected by the Icelanders in the neighboring streams. They had had a bad season, having caught only 20,000 pounds in weight, 30,000 being their usual average. Several similar establishments[5] exist on the various salmon rivers, and there is one in the north from which 50,000 pounds of kippered fish are annually sent to Denmark.[5] The supply is literally inexhaustible.[5] Laxá river is one of the greatest localities for salmon fishery.[6] Here, even as far back as 1810, Mackenzie finds the natives catching 2,000 and 3,000 pounds of fish, and recommends the occupation as fit for good speculation.[6] There are six kinds of salmon. For a description of the Icelandic manner of catching fish, see Henderson, page 414; also, Hooker, vol. I, p. 226.

Shark and seal.—But the sea contains other fish besides the cod. The shark and seal fisheries have their importance. On the north coast[7] of the island sharks are caught in great abundance a few miles from land.[8] This fishing is done in the summer season, from April to the beginning of September.[8] The shark oil, or rather the shark-liver oil, is boiled out at little establishments on the coast;[8] the shark skin is made into shoes,[7] and the flesh is smoked and eaten.[7] There is a kind of dog-shark, which is considered an especial luxury. Before it is fit for eating and ripe for appreciation, it must have been buried two years in the sand. The epicures of Iceland consider this their "crack" dish; its only disadvantage being that it renders the eater unapproachable for—Dillon[9] says—three weeks. We may add that horse-eating is said to be practiced, as by some more polished nations; but in Iceland is commonly regarded with special disgust.[9]

Herring once abounded in Iceland, but have disappeared.[10]

Trout are abundant in Thingvallavatn.[11]

STATISTICS OF FISHERY.

A few statistics, now, in regard to the fisheries, would be convenient. We regret not being able to give those which are undoubtedly given in the French official returns. We must content ourselves, for the present, with presenting the few details we have picked up from other sources.

Exported from Iceland in the year 1806.—*(Approximately.*[12]*)*

Fish	650,000 pounds.
Dried fish	750,000 pounds.
Salted cod	150 barrels.
Cod oil	807 barrels.
Shark oil	1,663 barrels.
Seal oil	24 barrels.
Fish liver	12 barrels.
Salted salmon	28 barrels.
Salted shark skins	1,568
Total number of boats in Iceland in 1804	2,163
Number of French ships employed in cod fishing in 1860[13]	269
Total tonnage of French ships in 1860, (approximate)	12,000 tons.[12]
Number of French seamen employed in 1860[12 14]	7,000

[1] Hend., p. 281.
[2] Forbes, p. 331.
[3] Mck., p. 286.
[4] Forbes, p. 113.
[5] Forbes, pp. 120, 121.
[6] Mck., p. 204.
[7] Mck., p. 174.
[8] Ox., p. 163.
[9] Dill., pp. 83, 84.
[10] Hend., p. 92.
[11] Forbes, p. 97.
[12] See Appendix E.
[13] Forbes, p. 207.
[14] There seem to have been no French vessels in 1810.

(Imported from Iceland, Faroe islands, and Greenland, into Great Britain during the year 1864.)

Fish, (total)	1,065,800
Train or blubber oil, (from Denmark and Iceland)	72 tons.
Seal skins, (from Denmark and Iceland)	1,210

MINERAL RESOURCES.

COAL.—LIGNITE.

Mineral coal does not exist in Iceland, or at any rate has nowhere been discovered, but the lignite deposits of which we have before spoken as existing on the northwestern peninsula are a substitute. This combustible has, within the past few years, been the object of experiments by the steamship company from Denmark to Iceland, with what results we do not know. We have not been able to find any analyses of the surturbrand, but from its aspect as described by competent observers and from their remarks upon it, we are persuaded that it must one day contribute, both directly and indirectly, an important aid to the industrial progress of the island.

Sir G. S. Mackenzie speaks[1] of certain pitchstones, found in the country, which are highly combustible, but they do not exist in any large quantities. It is to the present and past drift that we must look to supply fuel. We do not speak of these combustibles as possible articles of commerce or as a source of revenue, but as a native burning material of unspeakable value to local steam locomotion, either on sea or on land, to future manufactories and to domestic use. But there is a mineral product in Iceland which has a value extending to the rest of the world—one which under proper management might be to-day, as it certainly will become at some future, nearer or more remote, a source of wealth, an inducement to immigration, and a benefit to the government who shall carry on and protect its exploration. We refer to sulphur.

SULPHUR.

There are two principal fields of sulphur in Iceland, one near Krafla and Reykjahlidh in the northeastern, the other at Krísuvík in the southwestern corner. The former is by far the most extensive region,[2] but the latter gives the purer product.[3] Every traveller gives us a description more or less minute of these sulphur hills, and the beds of pure yellow, often a foot thick, which extend about them.[4]

Up to a few years ago the sulphur had only been explored in the rudest way by the natives.[2] The industry thus carried on was almost insignificant in result, and was soon abandoned when the supply of surface material became scanty.[5] Still the exportation of sulphur was enough during the days of the peasant mining to give the brightest hopes of what it would be under enlightened management and economy; for during 40 years the exported quantity amounted on an average to 22,000 pounds a year.[6] One of the most interesting and remarkable facts connected with these mines is that a region apparently exhausted becomes resulphurized again, so that the stores of brimstone are practically as inexhaustible[7] as those of the infernal regions. Although the mines of Krísuvík are 20 miles from Hafnarfjördhr, one of the best harbors in the island, and those of Krafla are further still from the seaboard and from the principal trading station of Húsavík, it would appear that Icelandic sulphur is excessively cheap,[8] half the price, say some, of Sicilian sulphur. With improved means of trans-

[1] Mck., p. 368.
[2] Hend., p. 147.
[3] Ox., p. 138.
[4] Miles, p. 203; P. and Z., pp. 70–72, 190–192.
[5] Hend., p. 129.
[6] Hend., p. 129; Ox., p. 138.
[7] Hend., p. 129; Miles, p. 205; Duff., p. 183.
[8] Miles, p. 203; Ox., p. 138.

portation it would control the market. The Oxonian, remarking on this, says, (p. 138,) "like everything else in Iceland the light is under a bushel." Our most trustworthy information comes from Forbes, who, being an officer, sees the importance of the sulphur supply, and enters energetically into a thorough discussion on the prospects of the Iceland beds. We shall give the substance of what he says.[1]

The deposits are formed by the decomposition of the sulphurous fumes that burst up from the ground, and afterwards sublimated as solid sulphur. A part is mixed with clay; a part is almost pure sulphur, containing but four per cent. of gangue. The number and energy of these sulphur gases continually coming up is incredible; they have saturated the earth over a region (and here he is speaking of the smaller region of Krísuvík) of 25 miles in length. The sulphur-earth, or impregnated clay, averages from six feet to three feet in thickness, and contains 50 or 60 per cent. of pure sulphur. In the north the sulphur is even more extensive, but it is not easy to get at, and is not so pure. Our author quotes from Monsieur Robert's[2] description of the northern district, as follows:

Sulphur is found also at Námafjall (in the north of Iceland) in geological circumstances analogous to those of the beds at Krísuvík. It is found there generally in concrete masses of a citron yellow color, quite pure, sometimes very plenty, and generally associated with lime and silica. * * * It is to be regretted that the Danish government does not favor this industry, which would furnish as fine sulphur as that of Sicily, and doubtless at a lower price. Besides, Denmark possesses in Iceland immense stores, which will one day be of great value to her when those of Sicily are exhausted. She ought never to grant the English the permission they have desired, to work these mines, as has been done in Lapania in regard to the copper mines.

So says the Frenchman, who sees the importance of the mines in time of war. But Forbes congratulates himself that what the Frenchman hoped never to see has actually taken place, the entire southern district being purchased by an Englishman, Mr. Bushby, who likewise holds the refusal of the north.

Forbes says:

That gentleman visited the island in 1857, in her Majesty's ship Snake, and explored the principal portion of it. Much struck with the dormant wealth of the sulphur districts, and their value to England in the event of the Sicilian supply being cut off during war, after considerable trouble he induced the peasant-proprietors to part with their titles.

To develop the Krísuvík mines, Forbes says, in the same connection, capital would doubtless be required. He proposes a route for the transportation of sulphur to Hafnarfjördhr, but his topography is not sustained by Ólsen's map. Judging by the trifling cost of production, he says, and moderate freight home—the numerous vessels coming from England with salt returning in ballast—sulphur gathered from these sources would be able to undersell the Sicilian market by almost a half.

OTHER MINERAL PRODUCTS.—ICELAND SPAR.

Besides sulphur, the mineral products of Iceland of any commercial value are very limited. The eastern coast is little known, but there is found[3] the Iceland spar, (calcite, Dana,) or double-refracting crystal, used for making polarizing instruments, as well as certain ornamental stones, (obsidian,) some magnificent zeolites, much prized by mineralogists, and splendid calcedonies.

IRON ORE.—SALT.

Iron ore is said to exist,[4] but, unless it be of superlative quality, no use could be made of it with the present scarcity of proper coal or wood.

Salt works have been established in various places, and the numerous salt springs and hot springs were sought to be made available as sources of the

[1] See Forbes, pp. 101, 109, 110, 111, 112.
[2] G. Min., vol. I, p. 274.
[3] Lipp., p. 888, and Encyc., p. 147.
[4] Article on Iceland in Chambers's Cyclopædia.

material or as sources of heat. But this manufacture languished in the true Icelandic fashion.[1] Indeed, in 1845, Iceland still imported salt.

TRADE.

HISTORY OF TRADE.—FREE TRADE.

Before the year 1776 the trade of Iceland was monopolized by a company of Hamburg merchants settled at Bergen.[2] Then the King of Norway established his own factories in each port, but he soon found that the speculation was more profitable to his agents than to himself. He then opened the trade to all his subjects, interdicting by severe laws all foreign commerce.[2] After a while the trade again fell into the hands of a few grasping speculators,[3] and the Icelanders were compelled to follow their dictates. Against this system the Icelanders struggled manfully for many long years, till at last they were disfranchised by the law of 1865,[4] which opened their commerce to the world. This, indeed, was a great blessing to them; but, as new-comers, it has been hard for them to find a market for their wares. All they need now is an English or an American market,[5] to give them a stimulus to improve the quality of their wool and encourage them to larger industries.

EXPORTS.—IMPORTS.

The articles of export from Iceland are thus stated:[6] fish, (cod, salmon, liver,) salted mutton, oil, tallow, wool, stockings, mittens, skins, down, feathers, salt, sulphur, Iceland moss.

The articles of import[6] into Iceland are coffee, corn brandy, snuff, breadstuff, deal boards, soap, sugar, tobacco, potatoes, iron, lines, hooks, &c.

TRADING.

Toward the end of June the period of traffic commences, and all the natives repair to the trading stations.[7] There are 21 ports,[8] but the principal ones are Reykjavík and those on the Eskifjördhr, Ísafjördhr, and Eyjafjördhr, these being the centres of the four commercial districts.[9] The districts of Reykjavík and Ísafjördhr supply the greatest quantity of salted and dried fish, and from the latter the greater part of the oil is exported.[10] The other districts are the centres of the wool, mutton, and tallow trade.[10] The majority of the shipping is for Copenhagen,[11] the rest goes to the Mediterranean ports, so that it must not be supposed that the tables showing the ships arriving in Great Britain give by any means an indication of the general commerce of Iceland. Indeed, at Reykjavík the shipping is very considerable, the ships arriving there from Denmark during May by twos and threes every day.[12]

CURRENT PRICES.

We give here a list of the current prices of Icelandic produce for the year 1810, taken from Sir G. S. Mackenzie's work:[13]

		Approximate.
1 pair mittens	4 skill. to 6 skill. = $0 00	$0 05
1 pair stockings	12 skill. to 18 skill. = 0 00	0 08
1 pair fine stockings	64 skill. to 96 skill = 0 32 to	0 55
1 woollen jacket	40 skill. to 64 skill. = 0 20 to	0 32
1 fine wool jacket	192 skill. to 258 skill. = 0 96 to	1 30

[1] Ox., p. 151.
[2] Dill., p. 285.
[3] Miles, p. 299.
[4] Miles, p. 302; Forbes, p. 69.
[5] Ox., p. 249.
[6] Hend., p. 401; Dill., p. 287; Miles, p. 58; Forbes, p. 312; Duff., p. 140; Mck., p. 284.
[7] Forbes, pp. 312, 313.
[8] Dill., p. 286.
[9] Mck., p. 285.
[10] Mck., p. 285, and Dill., p. 287.
[11] Dill., p. 288.
[12] Dill., p. 177.
[13] Mck., p. 284.

			Approximate.
1 pound of wool	12 skill. to	20 skill. =	0 06 to 0 10
1 pound of eider down	2 rixd. 48 skill. to	3 rixd. =	1 35 to 1 65
1 pound of feathers	16 skill. to	20 skill. =	0 08 to 0 10
1 pound tallow	16 skill. to	22 skill. =	0 10 to 0 11
1 pound of butter	10 skill. to	28 skill. =	0 05 to 0 14
1 skippered stockfish	12 to	20 rixd. =	6 00 to 10 00
1 skippered salt fish	15 to	30 rixd. =	8 00 to 15 00
1 barrel of oil	12 to	20 rixd. =	6 00 to 10 00
1 white fox skin	80 skill. to	3 rixd. =	0 40 to 1 50
1 black fox skin	5 skill. to	8 rixd. =	0.025 to 4 00
100 swan's quills	2 rixd. 48 skill. to	3 skill. =	1 35 to 1 65
A horse	6 rixd. to	40 rixd. =	3 00 to 20 00
A cow	16 rixd. to	24 rixd. =	8 00 to 12 00
A ewe with lamb	2 rixd. to	2½ rixd. =	1 00 to 1 25
A wether	2 rixd. to	5 rixd. =	1 00 to 2 50
A lamb	80 skill. to 1 rixd.	32 skill. =	0 40 to 0 75

In "Oxonian's" time articles seem to have risen from these prices. He gives[1] as examples: train oil, worth about $12 50 a tender; tallow, worth about 12 cents a pound; wool, worth about 21 cents a pound; butter, worth about 15 cents a pound.

FUTURE.—TELEGRAPH.

The future of Iceland is closely connected with the future of her mother government. If the same regime which has controlled the affairs of that island continue in the years to come, the "best land the sun shines upon" can never hold an important position among nations. If, however, a more liberal system should be adopted, and the natural energy of the people be encouraged, the world would be surprised at the rapid advance of this little northern island. We have shown what effect such a government would have on agriculture and the sulphur mines. Let us now, in conclusion, speak of another point which to-day is exciting interest in other directions. Forbes says, (pp. 330, 332, 333:)

> In these days of universal telegraphy not the least important feature in Iceland will be its adoption as one of the chain of ports by which Europe and America are to be connected. The manifest advantages of a north Atlantic telegraph would be that four electrical circuits would be obtained, none of greater length than 600 miles. Colonel Shaffner of the United States obtained in 1854 an exclusive right from the Danish government to establish a telegraph. His proposed route is: from Sartland to Faroes, 250 miles; Faroes to Iceland, 350 miles; Iceland to Greenland, 550 miles; Greenland to Labrador, 600 miles.

A shorter distance between Iceland and Greenland seems possible.

There are only two objections to this line worthy of notice—the icebergs of northern coasts and the submarine volcanic line off the southwestern extremity of Iceland. This can be avoided by landing the cable on any of the many eligible spots between Portland and Cape Reykjanes, and thence carrying the line across the country to any part of Faxáfjördhr. All these parts of the coast are free from icebergs; the shore ice, of which there is little, would not interfere with telegraphy any more than it does in the American lakes and in the Baltic.

Last year a portion of this proposed route was surveyed by the English and found to be highly favorable to a telegraph.

The advantages of such a route are too evident to be insisted on.

[1] Ox., p. 249.

GREENLAND.

EXPLORERS AND THEIR BOOKS.—WANT OF MAPS.

The many Arctic explorers have been remarkably diligent in publishing their experiences. Every new visitor to the romantic regions about the pole writes us his story, so that there is hardly a part of the world about which so much has been said or which has received so large a share of public interest as this of the far north. It might be supposed that from all these varied narratives it would be easy to become acquainted with Greenland; and indeed we have only to picture to our minds a vast glacier, a land of eternal ice and snow, bordered by a sea which at times is partly itself a solid continent, at times swarms with icebergs and floes, and we arrive at a general conception of the country. But as soon as we attempt to fix the details of its geography and to define its precise condition and resources, we find how few real data there are. For instance, it certainly seems strange that, for a country which has so long been the object of interest to geography, we should be unable to find two maps or charts that agree, nor any single one in which we can put entire confidence; yet so it is, not only in regard to the mysterious regions of the far north and the desolate interior, but also for the inhabited coast. As for the condition of the Greenlanders and their industries, we have had to rely mainly upon chance remarks let fall by entertaining narrators. Thus, from the vast amount of material which we have been obliged to dig over, we have collected but a meagre gleaning. But what more, after all, should we expect to find about a land of so little richness as Greenland? Situated far away from the ordinary channels of interest and industry, blighted by a severe climate, and supporting a small and almost worthless population, it is only natural that those who journey thither should bring us back little more than descriptions of the strange picturesqueness and poetry of the scenery and accounts of their own hardships and adventures.

We have given in our appendix a list of the Arctic explorers as drawn up by Captain Osborne, himself an Arctic traveller, and an active member of the Royal Geographical Society. Most of the later travellers, besides their object of finding the clue to the story of Sir John Franklin's fate, have had the ambition to reach the north pole, and to confirm or destroy the hypothesis of an open Polar sea. Dr. Kane's expedition is claimed to have solved this latter problem; but, as is well known, many high authorities doubt that Morton saw the extremity of Greenland. We mention especially Osborne, who argues against the assertions of Morton, and denies his competency as an observer; and Petermann, perhaps the most learned authority on Arctic matters, who, accepting the observations, believes the sea of Kane to be an indentation only from the sound.

GEOGRAPHY.

SIZE AND SITUATION.

Greenland (Danish: *Grönland*) is an immense island, the general breadth being from east to west six hundred miles.[1] Its southern extremity is Cape Farewell, in latitude 59° 49′ north. Thence it extends northward to a limit which is as yet unknown, or doubtfully conjectured, but which Dr. Hayes believes to be an open sea of an average diameter of two thousand miles.[2]

[1] Encyc., p. 38.—(In all parts of *Greenland*, Encyc. means vol. x of the eighth edition.)
[2] Hayes, O. P. S., p. 356.

GENERAL ASPECT.

The general aspect of the country is dreary enough. It is a vast reservoir of ice—a huge glacier, perpetually supplied from its interior, and moving ceaselessly toward the sea with the phenomena exhibited by the glaciers of the Alps.[1] This table-land of ice rests upon a foundation which seems to be sinking[2] little by little—a few feet a century[3]—in its southern part, and upheaving[2] toward the north, where it is broader.[4] The interior of this ice-field is completely unknown, and conjecture alone can help us to fill that immense blank on the map. Its shores are indented with deep inlets, and beset with rocky islands.[4] In some sheltered spots in the south, these fiords are bordered with meadow-lands and beech and willow,[4] whence, probably, the name Greenland, given to it by Eric, the first colonist.[5] The western shore of Greenland is that which has the greater interest, as it is the one which has been carefully explored, and contains all the settlements. It is to that that we confine our attention. Baffin's bay, whose waters wash this coast, is invaded with ice, sometimes partly as a barrier wall, sometimes as floating bergs. The phenomena exhibited by the ice in its various states, in process of formation, instability in motion, and in melting, have been the study of the Arctic explorers. At present the ice navigation, once so little understood, and so dangerous, has been reduced to almost as great precision and certainty as the navigation of the high seas.[6] The northern part of Baffin's bay is now called Melville bay, and is defined as extending as high up as the "North Water;" that is, to latitude 76°.[7] North of this bay the coast has no general interest, there being no settlements, and only from time to time detached Esquimaux huts. But it is the upper Greenland, beyond the North Water and above Smith's sound, which has been the scene of the labors and adventures of Kane and Hayes. We are thus driven to less modern authorities for the bulk of what we say regarding the settled and productive portions of Greenland. An excellent description in the Encyclopædia Britannica, prepared by the Rev. (formerly Captain) William Scoresby, "a venerated authority,"[8] will serve as a basis to our description of this coast and its inhabitants;[9] and during this account, whatever is not vouched for by other authority comes from that valuable article.

Let us, however, glance at the maps of Hayes, Kane, and Petermann, delineating these extreme northern regions, merely to mention a few of the most important geographical facts there indicated. Capes Alexander and Isabella are the opposite headlands that guard the entrance to Smith's sound. On Cape Alexander we find some vegetation and a few birds, but north of that the coast is bare.[9] Into the interior stretch the vast Mer de Glace and Humboldt's glacier, over a large peninsula, extending from the Arctic highlands in the south to Peabody bay in the north, a peninsula for which the renowned geographer of Germany, Augustus Petermann, proposes[10] the name of Hayes's peninsula. Near Port Foulke, directly north of Cape Alexander, there are numerous reindeer.[11] This whole coast is new to geography—almost all of it being first known through the labors of American explorers and bearing the names of distinguished Americans. The discussion of the results of these expeditions will be found in Petermann's article. We must turn away from these extreme regions to investigate those which have importance as producing countries.

South of Cape Alexander, but few Esquimaux are found and little life of any kind is seen, till we come to Northumberland island, which abounds in birds, foxes, grasses, and cochlearia.[12] (See Petermann's article.)

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[1] Hayes, O. P. S., p. 138.
[2] Hayes, O. P. S., p. 402.
[3] Lyell, Geol., p. 145.
[4] Som., pp. 159–'60.
[5] Encyc., p. 38.
[6] Hayes, A. B. J., p. 89.
[7] Hayes, O. P. S., p. 58.
[8] Kane, I, p. 307.
[9] Kane, I, p. 454, note to p. 46.
[10] Petermann's Mittheilungen, 1867, p. 192.
[11] Hayes's map, O. P. S., 96.
[12] Kane I, p. 333; Hayes, A. B. J., p. 93.

The northernmost point of colonization is Yotlik.[1]

Settlement.—Greenland was discovered by Gunbiörn, an Icelander, early in the tenth century, and was first colonized by Icelandic adventurers, about 983. Many other emigrants went thither, at nearly the same time, from Norway and the Orkneys; and for several centuries the colonies, which were all probably, like the modern Danish ones, on the west coast, increased in numbers, and kept up a prosperous trade with Norway. But, towards the beginning of the fifteenth century, they were attacked by the Esquimaux, the aboriginal population of the country; and almost simultaneously their community was devastated by the *Black Death*, which was then everywhere the terror of civilized man. The European inhabitants of Greenland seem to have become absolutely extinct; for, from this time, nothing more was heard of these ancient colonies.

During the last 150 years (from 1721) the Danes have formed numerous settlements on the western coast, between latitude 60° and latitude 73° north. There are now 13 colonies, including some smaller settlements called factories. They form two jurisdictions, governed each by a royal inspector,[2] and bearing the names of North Greenland and South Greenland.

Population.—The population of the Danish colonies was 7,000 in 1832;[3] 8,735 (of whom 234 were Europeans) in 1845;[4] 9,896 (of whom 248 were Europeans) in 1855.[5] The whole number of inhabitants in the far north, in the interior, and on the eastern coast, is utterly unknown; and Crantz's estimate,[6] given on the authority of "a factor who lived many years in the country," is a mere conjecture. Kane states[7] that the natives of the upper coast have been greatly thinned out by small-pox, and that many have in consequence fled to the protection of the colonies. This may account for the increase exhibited by the Danish statistics. The opinion that the native tribes outside of the colonies are disappearing is, however, strongly questioned by Markham,[8] who thinks it by no means improbable that the cheerless and unexplored wilds of central Greenland are supporting a scanty population even to the pole.

Danish colonies.—The sites of the Danish colonies have been chosen with reference to their trading facilities.[9] They are for the most part profitable to their government;[2] and they maintain the government employés and natives in comfort and abundance. The people live exclusively by hunting and fishing; and from the district of Upernavik alone two vessels, of three hundred tons each, are annually freighted with the products of their industry and hardy skill, consisting of whale, seal, and shark oil; seal, fox, reindeer, and bear skins; eider down, walrus, and narwhal ivory; codfish and other articles of less value.[2]

The northern inspectorship contains the following colonies, which we name in the order of their position, beginning at the north:

1. Upernavik, though of recent formation, already one of the most important colonies in North Greenland, having, in 1855, a population of 547 souls, of whom 23 were Europeans.[10]

The principal settlement contains about 200 inhabitants.[11] It has a government house, a church, a school-house, two storehouses, a shop, two blubber-houses, and some dozen Esquimaux habitations.[12] The entrance to its harbor is somewhat unsafe.[13] Tessuissak, in this colony, situated in latitude 73° 40′ north,[12] has a small harbor.[14]

Prŏven has a snug but tortuous harbor. It is situated on a gneissoid spur of land on the southern slope. There is a government-house here. The trade is exportation of seals. Behind the town is a valley rich with Arctic vegetation.

[1] Kane, I, p. 32.
[2] Hayes, Sm. R., 1861, p. 152.
[3] Encyc. Brit., seventh edition, x, p. 762.
[4] Encyc., p. 39.
[5] Meddel., IV, p. 155; see also Appendix C.
[6] 30,000 in 1730, 20,000 in 1746; the decrease due to small-pox, (Crantz, I, pp. 10, 11.)
[7] Kane, II, pp. 119, 120.
[8] Mark., pp. 88, 97.
[9] Kane, I, p. 21.
[10] Meddel., IV, p. 155.
[11] Hayes, O. P. S., p. 39.
[12] Hayes, Sm. R., 1861, pp. 151, 152.
[13] Hayes, O. P. S., p. 35; McD., p. 42.
[14] Hayes, O. P. S., p. 54.

2. Omanak, founded in 1758; containing, in 1855, a population of 695, of whom 23 were Europeans;[1] noted for its extensive seal fishery; and having coal mines which supply the colony.

3. Rittenbenk, founded in 1725; having, in 1855, a population of 386, (11 Europeans.)[1]

4. Godhavn, or Good Haven, on Disco island, latitude 69° 12′ north, the principal colony of North Greenland, and the residence of the inspector;[2] population, in 1855, 309, (18 Europeans;)[1] having a coal mine which supplies the other settlements on Disco bay with that article.

5. Jacobshavn, or Jacob's Haven, founded in 1741; for some time one of the most advantageous establishments on Disco bay; population, in 1855, 358 (22 Europeans.)[1]

6. Christianshaab, or Christian's Hope, founded in 1734; population, in 1855, 476, (14 Europeans.)[1]

The factory of Claushavn belongs to this colony.[3]

7. Egedesminde, or Egede's memory, founded in 1759 by a son of Hans Egede, (see 10. Godthaab;) population, in 1855, 873, (17 Europeans.)[1] The main settlement is on the island of Ausiet, in Disco bay. Between this and Fox island there is a very secure harbor. A great many seals are caught here, but the collecting of eider down forms the most important branch of industry.

This colony comprises many large and small islands; among which are Kronprindsens Eiland and Hunde Eiland.

The southern inspectorship contains the following colonies:

8. Holsteinborg, founded in 1759; population, in 1855, 847, (10 Europeans;)[1] one of the dryest places on the coast,[4] with an important trade in reindeer skins.

9. Sukkertoppen, or Sugar Loaves, so called from three pointed hills; founded in 1775; population, in 1855, 784. (16 Europeans;)[1] having one of the best and safest harbors in the country.[5] This is the principal depot for reindeer skins,[6] with which the Danish market is supplied by this colony and Holsteinborg.[7] When Kane was at Sukkertoppen, (10th July, 1853,) 4,000 skins had been sent to Denmark during the season, and more were on hand.[8] There is an important trade in seal blubber.

The Nappasok islands[9] belong to this colony.

10. Godthaab, or Good Hope, the oldest colony in Greenland, founded in 1721 by Hans Egede, a Norwegian, who settled in Greenland as a missionary, with his family, before the Danish colonization; population, in 1855, 869, (33 Europeans.)[1] It is the residence of the inspector of South Greenland.

Neu Herrnhut, in the colony of Godthaab, founded in 1733, is one of three Moravian settlements, for a detailed account of which see Crantz's *History of Greenland*, books V–X. The population of this place was 440 in 1761.[9] In 1855, the number of Moravian missionaries and catechists in Greenland, with their wives, children, and servants, was 241.[10]

The Klingarne islands are excellent seal-fishing grounds.[11]

11. Fiskernæsset, or Fish Point, founded in 1754; population, in 1855, 437, (15 Europeans;)[1] having an extensive seal fishery, carried on by the Danes, by means of immense nets; rejoicing, also, in an excellent cod fishery. The place has, according to Kane, an enviable reputation for climate and health. Except perhaps Holsteinborg, it is the dryest station upon the coast; and the springs, which well up through the mosses, frequently remain unfrozen throughout the year.[12] The channel of the harbor has moderate draught.

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[1] Meddel., IV, p. 155,
[2] Hayes, O. P. S., p. 444.
[3] Encyc. Brit., seventh edition, x, p, 756.
[4] Kane, I, p. 21.
[5] Crantz, I, p. 12.
[6] Kane, I, p. 28.
[7] Kane, I, p. 22.
[8] Kane, I, p. 29.
[9] Crantz, I, p. 11.
[10] Meddel., IV, p. 174.
[11] Crantz, I, p. 7.
[12] Kane, I, pp. 21–23.

Lichtenfels, in this colony, founded in 1758, is a second Moravian settlement.[1] There are many remains of ancient dwellings here.[2]

12. Frederikshaab, or Frederick's Hope, founded in 1742; population, in 1855, 716, (8 Europeans;)[3] a good haven, and a place of traffic.[4]

13. Julianehaab, or Juliana's Hope, founded in 1775; population, in 1855, 2,599, (38 Europeans;)[3] the most important colony of South Greenland; extending beyond Cape Farewell along the eastern side of the island. There is always a pretty regular exportation of seal blubber, seal skins, &c.[2] Hence the Danish market derives its supply of the valued furs of the saddle-back seal.[5]

Friedrichsthal, in this colony, near Cape Farewell, is the third Moravian settlement.[6]

EASTERN COAST.

Of the eastern coast we have but few accounts. There is, however, a brief account of Graah's voyage to the east shore, in 1829, in the Journal of the Royal Geographical Society, vol. 1, for 1832, page 247. From this we learn that Graah went to Nenortalik, whence he started March 20, 1829. On the 1st of October he reached Nugarbik, in latitude 63° 22′ north. His object was to find ancient Icelandic remains, but he was unsuccessful. He found, however, certain Greenland tribes that possessed rather a Scandinavian than Esquimaux character and appearance. All the coast is colder, more barren and miserable than the west coast. It may be said to consist of one uninterrupted glacier, exhibiting only a few patches of vegetation, generally on the banks of the rivers. During the whole summer of 1829 there was not one day that could be called warm; and, before the 14th of June, the thermometer had never risen above 51° Fahrenheit. At Ekolumies, in latitude 63° 20′, the vegetation appeared superior to that of any other part of the coast, even of Julianehaab, which is reported to be the most favored part of the west coast. This vegetation consists of fine grass, sorrel, low bushes of willow, and birch. The food is dried seal's flesh, with a little game and fish. At 63° 36′ there are bears, hares, birds, and salmon. In latitude 63° 11′ 12″, at Amitoarsuk, Graah found an excellent harbor.

CLIMATE OF THE EXTREME NORTH.

The climate of Greenland, although severe, is one of unusual healthfulness.[7] In glancing at the table in our Appendix B, it will be seen that Greenland is much colder than Iceland. While the average temperature of the year is 39° for Reykjavík, it is 27° in Godthaab and Neu Herrnhut, which are in a lower latitude, while the temperature of Lichtenau, 200 miles to the south of Reykjavík, is 6° colder during the year. As for the far northern parts of the country, we find there those seemingly fabulous temperatures that have astonished us in the narratives of Kane and Hayes. As is well known, the seasons in the polar regions are a long summer day and a long winter night; but such a defined division is rather artificial, for there is hardly any precise limit to the seasons. Winter is the great dominant period, but it is better to divide the year of the extreme circumpolar regions as follows:[8]

1. Winter; season of fast ice.
2. Time of water-drops.
3. End of May; season of thaws.
4. Middle of August; season of no ice.
5. Last of September; season of freezing.

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[1] Kane, I, pp. 25–27, 453.
[2] Encyc. Brit., seventh edition, x, p. 756.
[3] Meddel., IV, p. 155.
[4] Crantz, I, p. 4.
[5] Kane, I, p. 22.
[6] Kane, I, p. 453.
[7] Hayes, paper read before Sm. Instit.; 1858.
[8] Kane, II, pp. 208, 209.

It is during the first of these seasons that the fearfully low temperatures were observed by Dr. Kane in Rensselaer bay. From Kane[1] we quote a few of the more remarkable temperatures:

January 17, —49° Fahrenheit; 20th, —64° to —67°; February 5, —60° to —75°; five successive days of March, —46° (mean daily temperature;) March 18, —49°; 19th, —42° (mean;) 20th, —43°, —35° (mean;) 21st, —48°, —19° (mean;) 22d, —7° (mean;) 23d, —9° (mean;) 24th, —18° (mean;) 25th, —35° (mean;) 26th, —43° (mean;) 27th, —34° (mean.)

The lowest temperature at Rensselaer harbor was —68°.[2] Near an iceberg Hayes observed —68½°.[3] In summer, in these regions, the thermometer often rose to +35° or +40°;[4] and on the 4th of July, 1854, the mercury stood 53°.9.[5]

Petermann's article, given in our appendix, shows how much warmer the temperature is on the southern side of Hayes's peninsula, where the effect of the warm ocean current is felt, than at Rensselaer bay, where Kane wintered. A former article by Petermann, on the north and south pole, in the "Mittheilungen" for 1865, page 146, speaks of the immense influence of water currents on climate, though he does not there apply his principle to show how Baffin's bay is affected thus. Mr. Hopkins, of the Royal Geographical Society, maintains[6] that this theory of the enormous effects of ocean streams has been greatly exaggerated, and that the differences of climates and the irregularities of the isothermal lines depend much more on the winds, especially, in the present case, on the moist southern winds, than on any other causes. The discussion of this subject is irrelevant here, and we only mention these opinions to show that there may be more than one explanation for the fact that the western shore of Baffin's bay is much milder than the eastern.[7] A reference to the temperature charts of Dr. Kane shows a constant swerving of the temperature lines toward the pole as they cross the coast of Greenland. The easiest and most natural explanation of this fact is the Gulf Stream, which, sending a branch to the west of Baffin's bay, warms the water and indirectly the air. Dr. Hayes has shown that, were there an open Polar sea bounding Greenland on its north, it would have a strong result in tempering the climate of the shores.[8] The observations of Dr. Kane have not been able to prove anything in this respect. The climate of the far north is still a mystery.[9] It was from a deduced formula, and not from any direct observations, that Forbes maintains that the average temperature at the poles is 1°.[10] Some authorities entirely disbelieve that there is the slightest ground for believing that the climate grows warmer in nearing the pole.[11] Hickson, however, who discussed the whole subject before the Royal Geographical Society, and who has been one of the first to state the question clearly and represent the arguments in their true light, believes that, as the equator is not the line of maximum heat, so the pole is not the point of maximum cold; and he quotes the eminent authority, Sir David Brewster, as believing that the pole is warmer by 10° than any other part of the Arctic zone. We are compelled to refrain from a further comparison of opinion on this mooted question, and to consider rather the effects of this climate upon man. On this point we have the direct authority of Kane and Hayes, and the valuable opinions of Osborne and Petermann. Kane says[12] it is easy for Americans or Europeans to inure themselves to an ultra-Arctic climate. On account of the suddenness of the assault, it is soon found out whether a man is acclimatizable or not, whereas it is just the other way in the torrid zone. Hayes[4] speaks of the cold as being no barrier to

[1] Kane, I, pp. 154, 174, 179, 182, 183, 185.
[2] Hayes, Sm. Rep., 1861, p. 155.
[3] Hayes, O. P. S., p. 284.
[4] Hayes, A. B. J., p. 342.
[5] Kane, II, p. 425.
[6] Jour. Roy. Geog. Soc., vol. 27, (1857,) p. 206; also, Jour. Roy. Geog. Soc., vol. 28, (1858,) p. 362.
[7] Kane, II, p. 429.
[8] Hayes, O. P. S., chap. 32.
[9] Osborne, R. G. S., vol. 26, p. 292.
[10] Richardson, p. 251.
[11] McD., p. 281.
[12] Kane, I, p. 245.

an Arctic expedition, for even in the extreme rigor of the winter the cold is endurable. Osborne remarks[1] upon the change of opinion lately undergone in regard to the possibility of the endurance of Arctic winters. He says that Providence has peopled the frigid zone to the extreme latitude yet reached, and has placed the animals on which the inhabitants feed there also. As for Petermann, he says[2] he hopes to see the day when the north pole will be visited on pleasure trips, as the Swiss glaciers are now; he finds no objection in the severity of the climate.

CLIMATE OF THE COLONIES.

But of more importance to us is the determination of the climate of southern Greenland, in the settlements. We give an abstract furnished by Crantz[3] of a year in a Greenland colony.

The limits of summer are from the beginning of May to the end of September. In August it often snows, but also it is often quite hot. The weather is changeable, but not suddenly so. Most of the storms come in autumn. The general state of the atmosphere is remarkably pure and light, and of unusual healthiness.[4]

In August there was (1761) warm sunshine, with mist and rain from the south. Towards the end, ice in fresh water, yet warm sunshine; afterwards snow or cold rain. Temperature at Godthaab, 41°;[5] temperature at Neu Herrnhut, 37°; temperature (August) at Lichtenau, 41°.

September. First, northeast wind with warm sunshine, but ice in the shade. Secondly, south wind and warm weather; then southwest winds, with storms. Finally a south and a north storm, with frost in the ground and on the windows, even in sunshine. Fresh water froze two or three inches thick. Temperature at Godthaab, 36°; temperature at Neu Herrnhut, 34°; temperature at Lichtenau, 40°.

October. Northeast wind; much snow; northeast cold storm. Temperature at Godthaab, 30°; temperature at Neu Herrnhut, 33°; temperature at Lichtenau, 36°.

November. Northeast cold wind; alcoholic liquors frozen; northern bays frozen. By day, sun shone warm enough to evaporate snow; southeast storm; disagreeable weather. Temperature at Godthaab, 22°; temperature at Neu Herrnhut, 16°; temperature at Lichtenau, 26°.

December. Everything covered with snow; lightning sometimes; severe cold, then mild pleasant weather with southeast wind. Temperature at Godthaab, 17°; temperature at Neu Herrnhut, 12°; temperature at Lichtenau, 22°.

January. North and northeast winds with genuine cold; afterwards mild snowy weather, interchanged with clear cold. Temperature at Godthaab, 12°; temperature at Neu Herrnhut, 9°; temperature at Lichtenau, 20°.

February. Beginning, the same, then rain and slippery ice, thawing and rain, with east and south winds. Temperature at Godthaab, 13°; temperature at Neu Herrnhut, 22°; temperature at Lichtenau, 23°.

March. Constant fine, warm spring weather; better than it used to be about this time in Germany, with southeast and also northeast winds, but in the day mostly calm. Temperature at Godthaab, 16°; temperature at Neu Herrnhut, 22°; temperature at Lichtenau, 28°.

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[1] A. G. S., pp. 36, 281.
[2] Mittheil., 1865, pp. 146, 147.
[3] Crantz, I, pp. 43, 44, 46, 47, 50, 51, 52.
[4] Hayes, Sm. R., 1858.
[5] These temperature figures are taken from Appendix B, and refer to other observations. It will be observed that the observations made at Godthaab, have the most value, as they were taken during 13 years, while those at Neu Herrnhut and Lichtenau are from one year's and two years' observations.

April. Very cold northeast winds, then south wind and rain; one could bear to be without a fire; again cold and piercing. Temperature at Godthaab, 22°; temperature at Neu Herrnhut, 25°; temperature at Lichtenau, 32°.

May. Thawing weather, with intermingled frost and snow. After hot days cold nights and rain. Temperature at Godthaab, 32°; temperature at Neu Herrnhut, 32°; temperature at Lichtenau, 39°.

June. Warm; thaw; garden sowed; cold southeast wind for a time, then agreeable weather. Temperature at Godthaab, 39°; temperature at Neu Herrnhut, 30°; temperature at Lichtenau, 43°.

July. Rainy weather; warm, with hot south and east breezes, but mostly calm. Temperature at Godthaab, 42°; temperature at Neu Herrnhut, 40°; temperature at Lichtenau, 45°.

It seems, then, that any idea drawn from the published experiences of Arctic travellers, with their fearful tales of severe cold, must be false when applied to that portion of Greenland to be counted as within the limit of civilization. Kane and Hayes have proved that the climate of the extreme north does not preclude the possibility of healthful existence; but these other accounts show that that of southern Greenland cannot interfere with man's healthful development and prosperity.

FLORA.

Greenland has a much more Arctic flora than Iceland. There is some grass, but the principal vegetables are mosses, marsh plants, sombre lichens, the service tree, (bearing fruit,) red-snow, algæ, sorrel, birches, and dwarf pines.[1] Many of the common plants are astringent,[2] and are specifics against the scurvy. They are protected from destruction during the winter by a coverlet of snow.[3] The most important anti-scorbutic is the scurvy grass, a thick, tufted, juicy plant, of extreme fecundity.[4] The plants grow in greater abundance where they are submitted to the influence of the warm currents, (*vide* Northumberland islands,) or are protected by hills as in certain settlements. Morton observed an increase of vegetable life in his journey northward.[5] The want of vegetables compels the natives to rely almost entirely upon flesh and fish. They are the most carniverous people on the face of the earth, says[6] Osborne.

The southern extremity of Greenland, from Cape Farewell to Sukkertoppen, is found to possess nearly the same vegetation, as it has nearly the same climate, as Labrador.[7]

DRIFT FUEL.—COAL.

We have seen that in Iceland the want of indigenous fuel was supplied by a constant drifting of wood upon its shores. The same thing is true, though to a less extent, of Greenland. The currents that sweep round Cape Farewell bring a meagre supply of fuel.[8] But there are besides valuable mines of coal in Disco bay, and also in the far north in the Parry islands. The former of these are worked and supply the colonists with the means of resisting the inclement weather. The latter will one day have important bearings on the question of Arctic expeditions. But of this we shall speak further on.

ESQUIMAUX.

The natives of Greenland, the Esquimaux, are found as far north as explorers have gone.[9] It is a race similar in language, habits, and general character, to some of the north Asiatic tribes, (Kamtschadales, &c.[10]) This fact has an

[1] Som., p. 341; Encyc., p. 42.
[2] Kane, I, p. 271.
[3] Kane, I, p. 266.
[4] Encyc., p. 42.
[5] Kane, I, pp. 293, 462.
[6] R. G. S., pp. 36, 287.
[7] Durourd; Kane, II, p. 442, where see list of plants.
[8] Hayes, O. P. S., p. 60.
[9] Os., R. G. S., xxxvi, p. 26.—See Richardson, p. 290.
[10] Encyc. p. 43.

important bearing on the form of Greenland, and the climate of its more remote regions. It would be out of our province to discuss this question. We simply refer to the map of Petermann in our appendix, and to the late report[1] from the whalers north of Behring's straits, which seem to confirm the hypothesis before held of a polar continent, or of a continuation of Greenland westward.

The Esquimaux are square-built, hearty, deep-chested, merry-hearted.[2] They are very short, and have a general compactness of build, with a superabundance of flesh.[3] Their eyes are elongated,[4] their skin, either from dirt (see Crantz) or naturally, is yellowish, their cheek bones are prominent, and their flesh is soft and flabby.

As to the character of these people, Crantz gives us a favorable idea ; much more favorable than later authorities. A general characteristic of all Esquimaux is uncleanliness, especially in their habits of eating.[5] The anecdotes which Crantz and Kane and Hayes give about their devouring raw blubber and intestines with disgusting avidity, are familiar to all readers. The Esquimaux are exceedingly poor,[6] and exceedingly careless about being less so. Their utter improvidence and stubborn disregard of the future[7] leads them a life of continual activity to supply themselves and their families with the necessaries of life. They are self-reliant, brave[8] in resisting the great dangers to which they are every day exposed, perfectly callous, without any exhibition of emotion.[7] Their morality is good, though they often steal,[9] and are sometimes faithless[10] and treacherous.[11]

Almost all of those on the western coast profess Christianity, which exerts over them a refining influence in lessening their characteristic faults, and especially in encouraging their hospitality, which is now remarkable.[12]

We must refer to Hayes, to Kane, and especially to Crantz, for a description of the domestic life of this strange people, and of their methods of hunting and fishing.

The very marked characteristic, as we have said, of the Esquimaux, is his enormous appetite.

The keen climate, exciting him to a continual exercise, causes his system to demand a much larger amount of carbon than is needed by the inhabitants of a temperate zone. He is, therefore, obliged to hunt and fish continually, for his natural improvidence prevents his laying up a store of food for those seasons when animal life is less abundant. Perhaps this obstacle is after all a blessing to him, for the scurvy, that dire enemy which attacked and almost defeated Kane's party, is due not so much to the extreme cold as to salt provisions. In fact, it is entirely avoided, thinks Hayes, by a liberal diet of fresh meat.[13]

ANIMAL LIFE.

Greenland has been blessed with a remarkable profusion of animal life. The variety in the kinds of fish, flesh, and fowl is not more noticeable than the innumerable swarms in which they live. Even in the coldest regions food is to be found. It would be hard to find, says Kane,[14] a circle of 50 miles in diameter entirely destitute of animal resources. Petermann, in the Journal of the Royal Geographical Society,[15] gives a careful study to the animal life fit for food in the the Arctic regions. He enumerates the polar bear, the musk ox, the walrus,

[1] See recent New York papers on the discovery of the "Polar Continent."
[2] R. G. S., pp. 36, 288.
[3] Encyc.
[4] McD., p. 26.
[5] Os., R. G. S., xxxvi, p. 287.
[6] Hayes, A. B. J., p. 130.
[7] Hayes, O. P. S., pp. 114, 116.
[8] Kane, II, p. 212.
[9] Hayes, A. B. J., p. 131.
[10] Kane, I, p. 363.
[11] Hayes, A. B. J., p. 244.
[12] Kane, II, p. 121.
[13] Hayes, O. P. S., p. 151.
[14] Kane, vol. I, p. 244.
[15] R. G. S., vol. XXII, pp. 118, 127.

the whale, the moose, the reindeer, the wolf, foxes, polar hare, the seal, and various small quadrupeds, immense flocks of aquatic birds, the salmon, salmon trout, and herring. (See also Back, appendix.) The quantity of whales in the Polar sea north of Behring's straits is prodigious. This is due to a warm current of some kind, and we shall find the same profusion of animal life whenever an influence upon the climate produces a similar effect.[1] In looking at Petermann's map appended to this article, one will naturally be struck with this fact: were the strong arguments of geographers for a Polar sea on the northern shore of Greenland valid, then we must suppose that the remote and unexplored regions of Greenland have a milder climate and a more profuse fauna than the cold strip near Smith's sound. Kane says[2] that Morton observed an increase of animal life as he neared the open water, and he enumerates a list of some of the birds which were seen about the cliffs: Brent goose, eider duck, king duck, dorekie, arctic petrel, ivory gull, ash-backed gull, burgomaster, kittiwake, and sea swallow. If Morton saw these indications of a rich animal life near Kennedy channel, which Hayes afterwards found frozen over, what may we expect to find on the shores of an ever open ocean?

The reindeer of Greenland is used for food; his skin is made into clothing, &c., and it is exported in large supplies from the southern colonies; as for his horns, they are also an article of trade. Hayes observed[3] the reindeer very far north, with hares and blue and white foxes, which are also hunted for their skins. Kane, too, notices[4] the extended migrations of the reindeer, as well as the extreme latitude which the Polar hare reaches.[5]

There seems to be much uncertainty as to the limits of the musk ox, remains of which are found in many places to the northward.[6] There is a tradition among the Arctic Highlanders that there are herds of musk oxen far north on an island in an iceless ocean.[7] Can this island be that portion of Greenland which Petermann supposes between Kennedy channel and the Polar ocean, a strip of land which might easily be mistaken for an island, bounded as it is on two sides by open seas, and perhaps on the other two by ice-glaciers?

The Esquimaux dog is one of the most useful of the native animals, especially to the northern tribes who migrate from place to place on sledges. The dog is a large fine animal, remarkable for strength and ferocity.[8] In some places wild dogs are found who hunt their food for themselves in large packs.[9]

Dr. Kane was overrun by rats, which he found himself unable to exterminate.[10]

The seal,[11] the whale, and the walrus are the real support of the Greenlanders. Seal-skins are their clothing; blubber is their fuel; walrus and seal's meat, with any sort of fat, blubber, or oil, is their food. The whales are attracted to the coast of Greenland by the enormous numbers of medusæ, or sea-blubber, which swim in the waters and are a favorite food for all the large sea-animals.[12]

For a description of the dangers of seal and walrus hunting on the ice, we refer to Kane and Hayes, for such points do not come within our sphere.

NORTHERN WHALE FISHERIES.

As for the whale fishery it is described in all its details by Scoresby. We have rather to show the importance of it as an industry. To do this we give the official returns of the imports from Greenland into Great Britain during ten years.[13]

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[1] R. G. S., vol. XXII, pp. 118, 127.
[2] Kane, vol. I, p. 461, note 50 to p. 304.
[3] Hayes, Sm. R., 1861, p. 155.
[4] Kane, I, p. 80.
[5] Kane, I, p. 395.
[6] McD., p. 103; Kane, I, note 18, p. 81.
[7] Mark., p. 98, and Hayes, p. 35.
[8] Kane, passim, and Hayes, passim.
[9] Kane, I, pp. 455, note 14 to p. 65.
[10] Kane, I, p. 393.
[11] Crantz, p. 8.
[12] Encyc., p. 43.
[13] Parliamentary reports, XXVII, (1859,) and III, (1865,) p. 328.

Year.	QUANTITIES.			COMPUTED REAL VALUE.			
	Oil-train and blubber.	Seal-skins, undressed.	Whalefins.	Oil-train and blubber.	Seal-skins, undressed.	Whalefins.	Other articles.
	Tons.	*Number.*	*Tons.*				
1854..	1,716	62,376	51	£69,670	£12,475	£10,345	£426
1855..	3,151	173,302	25	160,071	77,986	6,697	461
1856..	3,860	17,053	143	181,420	50,781	46,278	375
1857..	2,237	112,347	57	97,820	25,278	25,270	247
1858..	2,779	75,923	76	106,298	60,379	41,921	441
1860..	2,427	63,553	78	72,810	41,301	30,994	179
1861..	2,513	10,608	115	87,320	2,021	41,210	64
1862..	1,732	40,154	64	67,336	8,031	27,220	36
1863..	1,128	33,683	33	52,926	6,026	16,864	141
1864..	1,376	63,601	17	61,920	10,336	7,120	402

MINERAL RESOURCES.—COAL.

The mineral resources of Greenland are at present little known. The existence of coal in Disco bay and in Parry islands we have already mentioned. It is a fact of the greatest importance, but we have no data for deciding upon the extent of the fields, or the nature of the combustible.

GEOLOGY.

A thorough exploration of the geology of Greenland would undoubtedly reveal many valuable quarries or mines, as her general conformation seems to be such as to give much promise. Her rocks are stated to be granite, gneiss, mica, and hornblende slate, syenite, clay slate, and her sedimentary rocks are of the primary formation, mostly of the coal period.

At present the only product of the earth that has any commercial importance—one which is peculiar to the country[1]—is kryolite. It is found in veins or beds in granite. One bed, 80 feet thick, is located at Irakaet,[2] on the south side of Arksudfiord, in western Greenland. It is a crystalline mineral, varying in color from snow-white, when pure, to almost black when mixed with extraneous substances, (probably graphite, as the coloring disappears when the mineral is heated; see Pogg. Annal.) Its chemical definition is a double fluorid of sodium and aluminium, corresponding to the formula Na. Fl., $\frac{1}{2}$ Al_2 Fl_3, or to the elementary composition: aluminium, 13.0; sodium, 32 8; fluorine, 54.2=100. It is at present mined at the aforesaid locality by Mr. Taylor, of London, who has sunk a shaft 40 feet deep, and exports large quantities of it. In 1861, 30 ships were sent from Greenland with kryolite, (Burat, 244.) It is to be found in the English, French, and American markets, either in blocks or ground up in barrels. It was first introduced into the Danish and English markets under the name of "natural soda;" it was so called on account of the extreme facility with which it was converted into soap.

The industrial uses of kryolite may be thus enumerated:

1. In the manufacture of soap.
2. In the manufacture of soda and the soda salts.
3. For the fabrication of fluorhydric acid.
4. As an ornamental stone.
5. For the manufacture of beautiful earthenware, colored at will, and almost unbreakable.
6. As a flux.

[1] Except that some is found in Miask, Siberia, in small quantities.
[2] Eriglok, (Pogg. Annal.)

The alkaline fluorides have been known by chemists as valuable fluxes in laboratory operations for some time. It has been thought that kryolite, which we have already said is a double fluoride of sodium and aluminium, might be thus used for facilitating the fusion of ores and the separation of the valuable metals. Colonel C. A. Stevens has applied this to industry, and will supply his flux in quantities large enough, and at a price low enough, to allow its advantageous employment in extensive metallurgical operations. The "Stevens's flux" has of late excited the attention not only of engineers but of the public at large, and frequent statements and opinions appear in scientific and manufacturing journals, as well as in the daily papers. Extensive experiments have been made with care and skill with a view to determine its effects upon the different ores. It seems to have been established that certain ores, particularly the pyritiferous gold ores, which have been rebellious to other methods of treatment, can be successfully smelted by the use of this flux, and that a generous percentage of metal can thus be extracted. It is hardly permissible to attempt any positive appreciation on the economy of the use of kryolite in metallurgy, for the present information is by no means sufficient; but we can say, judging from what has been published on the subject, that the kryolite trade is likely to receive a new impetus, and that a more extensive market will be offered to this already much-sought for mineral.

Kryolite is said to be consumed in larger quantities at the salt works of Pittsburg than in all Europe together.

In 1866–'67, 13 cargoes were brought to Philadelphia.

7. For the manufacture of aluminium and its alloys.

The last is a most important use.

Aluminium has been the object of numerous investigations made by distinguished chemists, and especially by Wöhler, Henri St. Clair Deville, H. Rosé, Bunsen, and Percy. They have shown that this new metal, so widely distributed in nature, forming, as it does, a component of all common clay, (clay being a hydrated silicate of the oxide of aluminium, or of alumina, more or less pure,) has an immense industrial value. We have within our nearest reach a metal whose properties are most precious to us. Let us rapidly review these properties.

Aluminium is of a fine white color and of fine lustre, resembling the purest silver. It takes a beautiful polish with great ease, and this shine is not impaired by exposure. It retains its color and beauty indefinitely; it never rusts or tarnishes in the air, whether the air be moist or dry, nor in water at any heat. It can be carried to an intense white heat before it oxidizes, and then the oxidation is feeble. Unlike silver, it is not attacked or blackened by sulphureted hydrogen. It does not dissolve in common sulphuric nor in nitric acid, unless heated. In muriatic acid aluminium dissolves with great difficulty, unless it is impure. The alkalies attack the metal more easily. Wine, vinegar, and common salt seem to have little or no effect upon it, much less than upon tin. It can be considered as a metal of absolute harmlessness for cooking, thus differing from copper and tin. (See Deville.) It is as malleable (when cold or hot) as silver and gold, and can be forged with as much delicacy. It can be hammered down to leaves as thin as those used for gilding or silvering. It is about as tenacious as silver, and its softness is about that of soft iron. It is easily melted and easily moulded. It has an extreme sonority, which adapts it for bells. Aluminium is the lightest of all the useful metals, its density being 2 56; that is, it is about three times as light as zinc and four times as light as silver. Supposing its price to be about that of silver, then an aluminium coin of the convenient size of a 10-cent piece would be worth two cents and a half. In fact as aluminium is now in France only a third the price of silver, (and its

value is decreasing,) a coin of one cent in aluminium would have about the size of an old silver piece of twelve and a half cents. For certain chemical and philosophical instruments and apparatus this quality of lightness, combined with unalterability by the common agents, is invaluable.

Aluminium forms with the other metals some valuable alloys. The one best known as a popular article for jewelry and other wares is the aluminium bronze, (*bronze d'aluminium.*) It is an alloy composed of aluminium, 1 part; copper, 10 parts. This alloy is very hard and durable; it can be rolled and worked into extreme perfection; is very ductile, and has the color and brilliancy of gold. It does not rust or tarnish. Above all it has a tenacity comparable to that of steel.

Aluminium is manufactured in France at different works, the industry having been introduced by St. Clair Deville, and encouraged by his Majesty the Emperor. It would be out of place here to give the history of the works or the methods employed; this is explained in the works of Deville and others. It suffices to say that the reduction of the ore is connected with and dependent upon the manufacture of sodium. Kryolite being a fluoride of sodium and aluminium, if not the most important ore, is always an invaluable agent for the production of the metal, so that by this new and increasing industry it has created for itself a valuable market.

Aluminium, as manufactured at the French works, sells for about $15 per kilogram, while aluminium bronze is not much dearer than fine copper. These products are sent to Paris and to other great centres to be worked up into objects of domestic use or of ornament.

Deville mentions, as some of the most advantageous uses of this valuable metal, the following:

As a precious metal in jewelry, for watch-cases, mirrors, and all other articles where the chief requisites are beauty, lustre, finish, and unalterability by rusting or tarnish; also, for spectacle-cases, opera and field-glass cases, coinage of small value, pendulum-rods, the smallest weights, pieces in balances and other instruments of precision, and for anything where great lightness is required; also, for spoons, forks, and dinner service, for cooking apparatus, &c., being unattacked by water, vinegar, salt, wine, and other organic matter.

We have entered somewhat at length into the qualities of aluminium, as they are not popularly as well known here as they are in France, where the metal is becoming commoner and more highly esteemed every day. As the Greenland coast alone of all places supplies a valuable material for the easy manufacture of aluminium, it will be seen that this mine will always have a great value. What is more, it is more than probable that the present beds are not the only ones to be found near by, and that new mines will soon be established.[1]

FUTURE.

In considering the future of Greenland, we cannot confine ourselves entirely to materialistic considerations. Nations have other resources besides those which figures can express to us by statistical tables. If a country has in it the means of developing man in any way, physically or mentally, it may be said to be rich to that extent. The northern whale fisheries will always maintain their importance; the seal-skin and walrus ivory trade will, in all probability, increase as new hunting grounds in the far north are discovered, as new means

[1] The above remarks upon aluminium and kryolite are based on a study of H. St. Clair Deville's lectures at the Sorbonne, 1865–'66, (manuscript notes,) his work "De l'Aluminium," Paris, 1859, Tissier's "Guide pratique de la fabrication de l'Aluminium," Dana's Mineralogy, Percy's Metallurgy, Rivot's Docimasie, and a host of reports, communications, &c., published in various scientific periodicals by Wöhler, H. St. Clair Deville, H. Rose, Bunsen, Charles N. A. Tissier, J. W. Tayler, C. Brunner, Salvétat, Salm-Horstmen, Erdmann, Heeren and Karmarsch, N. Debreeq, Mallet, Buff, H. Masson, Kobell, Boudet, Schötter, Hirzel, Degousse, Fabian, Christofle, Sauerwein, Schwartz, J. Thomson, Scherer, A. Strange, R. Wagner, Dullo, G. Hagemann, and others.

of transport are opened, and as new markets demand a supply; the mineral wealth of the country, in kryolite and other ores, will make rapid strides with further enterprise in extending the use of aluminium, and with demands for new material in other branches of metallurgy. But these are not all the riches of a country like Greenland. She has a vast interior, which is perfectly unknown, and a far north and west, which has only been guessed at. Who can tell what there is of material resource in those remote tracts? In a part of them we have every reason to believe that there is a warmer climate, a richer fauna, and a more favorable aspect than in any of the known portions of the island. But, even if we had no hope of finding there a place for settlement or new roads to profit, there are still strong reasons why civilization should strive to reach and explore them. They possess, as it were, the key to many problems of science, and the answer to many questions which are at present discussed by geographers. Certainly, new truths are as precious acquisitions as new mines or new fishing grounds, and a country which has supplied them has enriched the world as much as one which sends us the means of indulging our tastes or satisfying our appetites.

EXPEDITIONS.

Osborne[1] thinks it a shame that the royal geographers of London have on their maps 1,131,000 square miles of the globe's surface—a sheer blank—of which they are utterly ignorant; a tract, says he, that may be "teeming with life."

There is not only the geographical question, but also problems in other branches to be solved, so that all the world has an interest in the result of well-organized Arctic explorations.

We want to know the exact figure of the earth and the exact length of a degree, not only on scientific grounds, but also as having a practical value to navigators.[2]

We want to know, for similar reasons, the exact directions of the four cardinal points, and the relative position of the terrestrial and celestial poles.[2]

We want investigations about the direction and intensity of the magnetic force.[3] It will be remembered that the compass is useless in navigating the Arctic seas.[4]

We want observations on ocean currents, on winds, on the temperatures of air and sea, on the pressure of the atmosphere, on tides, and on the variations of gravity.

We want investigation of the Arctic fauna and flora. Here, we have to regret the loss of a large part of Kane's collection of natural history.

For all these observations, Hickson advocates a regular observatory at the pole.

In another field of science, we want ethnological researches, especially on the traces of ancient Icelandic navigators in Greenland.

Already, something has been done to advance our knowledge of the north frigid zone, as will be seen by looking over the list of Arctic navigators in our appendix and in referring to Petermann's article. Kane made a series of observations 650 miles from the pole; he showed the possibility of supporting life in extremest cold; he made some valuable geographical explorations, and claims to have discovered the open Polar sea.[5]

Hayes, too, has made some most valuable advances in this department of knowledge. He claims to have shown that the scurvy could be entirely avoided by fresh meat, that Port Foulke is a proper base for an Arctic expedition, that

[1] R. G. S., xxxvi, p. 290.
[2] Hick., p. 136.
[3] Hayes, Sm. R., 1861, p. 150.
[4] McD., p. 98; Hayes, A. B. J., p. 108.
[5] Kane, I, pp. 267 and 306; Hayes, Sm. R., 1861, p. 151; Rink., R. G. S., xxviii, p. 272; Os., R. G. S., xxxvi, p. 288.

Smith's sound can be navigated with a strong vessel, and that the Polar sea exists and can be visited.[1] He also made many observations now in the hands of the Smithsonian Institution.

Still, though much has been done, much more remains undone. The Polar region is a vast field for enterprise, and it is for the interest of the whole world that it should be explored thoroughly.

In regard to the ways and means of carrying on an Arctic expedition, opinions differ widely.

Kane names as the inducements in favor of his scheme:[1]

1. Terra firma as the basis of operations, obviating the capricious character of ice-travel.

2. A due northern line, which, throwing aside the influences of terrestrial radiation, would lead soonest to the open sea, should such exist.

3. The benefit of the fan-like abutment of the land, on the north face of Greenland, to check the ice in the course of its southern or equatorial drift, thus obviating the great drawback of Parry in his attempts to reach the pole by the Spitzbergen sea.

4. Animal life to sustain travelling parties.

5. The co-operation of the Esquimaux.

On the other hand, Petermann has always advocated, as he advocates in the article which we have translated and abridged in our appendix, an expedition by the sea between Spitzbergen and the pole.

Osborne believes[2] in Greenland as the right way to the pole. He advocates[3] a government expedition by the English navy, so that its fine organization and regularity added to every facility for fitting out and choosing vessels may contribute towards an ultimate success.

Hickson[4] suggests the *transportation of convicts* to the north to maintain stations in the Arctic seas. The discovery of coal-strata in the Parry islands has solved the difficulty of a want of fuel. The work of excavation would be made easy; there would be coaling stations for steamships, and Polar expeditions would become as natural and as easily carried on as any others.

Whatever be the method chosen, let expeditions be made.

The United States has inaugurated a brilliant line of investigation by Kane's and Hayes's expeditions. Let us hope, for her own honor and for the fame of American navigators, that what she has so gloriously begun will be followed up. If national glory has any meaning in the present state of civilization, it can be gained in no nobler way than by such achievements.

CONCLUSION.—ADVANTAGES OF A COLONY.

We hope, in conclusion, that it is not out of place to quote the following remark from Porter's Progress of the Nation.[5] It may have a bearing upon the question of Iceland and Greenland:

> The negative advantages offered to a state by the possession of its colonies consist in this, that their power and resources cannot be rendered available against it. This will be fully understood if we reflect upon the consequences that might result to England from the acquisition by the United States of America of the provinces of Nova Scotia and New Brunswick.

We omit what specially bears on these countries as having no particular application to our subject.

> It can hardly be said that England has hitherto drawn any *positive* advantages from the possession of these provinces, if we place out of view the convenience afforded during periods of war by the harbor of Halifax; but the *negative* advantages from them are evident, if we consider that the United States of America are greatly deficient in good harbors on the Atlantic coast, while Nova Scotia possesses, &c. * * * * *

[1] Kane, I, pp. 17, 18.
[2] R. G. S., xxxvi, p. 288.
[3] R. G. S., xxxvi, p. 279.
[4] Hickson, note, p. 139.
[5] Porter's Progress of the Nation, page 727.

In the unhappy event of a war breaking out between the two countries, the possession of these harbors by America would furnish her with means of annoyance to our commerce from national vessels and privateers, the magnitude of which is hardly calculable.

We have no need of pointing out the applicability of the same remarks to Icelandic sulphur and Iceland's harbors, nor to an ocean telegraph, *via* Iceland, were it established.

An abstract of a translation of the paper called Das Nördlichste Land der Erde, *by Dr. Augustus Petermann, April,* 1867.

THE ARCTIC REGIONS.

The appearance at last of Dr. Hayes's work concerning the Arctic expedition in the years 1860 and 1861, imposes upon us the duty not only of giving an account of this undertaking, but also of taking a nearer view of the geography of the regions in the far north. Till the discoveries of the two American expeditions under Kane and Hayes, Ross island was the northernmost land known; it lies in latitude 80° 48′ north. Parry in 1827 went two degrees further north, to 82° 45′, but discovered no land. Kane in 1854 followed the Greenland coast, reached latitude 80° 50′, and sighted Grinnell land to 82° 10′ north. Hayes extended his fearful sledge journey to 81° 35′ of north latitude, and estimated the visible extent to 82° 30′. Hence if the Americans have not succeeded in reaching Parry's point in the Spitzbergen sea, yet they have gone beyond all the English explorers on the American side, and have shown that that "Monroe doctrine" which allows European powers no share in American questions holds good for geographical science. The question of how far North America extends belongs to them, and we hope that self-sacrificing men, inspired for its solution, like Kane and Hayes, will have successors in the future.

The discoveries of these explorers are insignificant in extent, but they are of the highest importance to the science of geography, and cannot help being glorious, as full of boldness and perseverance. The names of Hayes and Kane must be counted among those of the greatest heroes. Indeed their contemporaries have already given an opinion, as Kane's book has excited more general interest than any other work on the Polar regions. But the precise results of Kane's expedition have been not at all or only deficiently understood, because the general reader does not care to make his comprehension of localities clear and definite.

The first requisite for this comprehension is a first-rate chart. But hitherto all have been faulty, the very best not being good. Kane's map, for example, is wanting in accuracy, in clearness even in names, especially near the important regions about Rensselaer harbor. We are thus in a continual state of doubt exactly where the explorers have been, even in Inglefield's map, the best that there is. Of course a just history of Arctic discoveries is impossible till an accurate geography has been established. It is one of the objects of the present paper to obtain an approximation to a good map by a comparison of the several accounts of Baffin and Bylot, Ross and Inglefield, Kane and Hayes. A detailed map of real worth is impossible till the elements of Hayes's observations, which have been given to the Smithsonian Institute, are made public.

HISTORY OF DISCOVERIES AND SURVEYS.

Our remarks (as well as the maps) are confined to the northernmost part of Baffin's bay and its coasts, beyond Melville bay and Lancaster sound; that is about 75° of north latitude.

In 1616, when Shakespeare was still alive, Bylot and Baffin, English seamen,

sailed up into these high latitudes. In 1615 they had striven in vain to effect a northwestern passage through Hudson's straits. In 1616 their plan was to pass through Davis straits, coast along Greenland, steer southwesterly to 60° north latitude, and finally to reach Japan. Their vessel, the Discovery, was a small one of only 55 tons burden, with a crew of but 17 in all. They left Gravesend March 26, 1616, and on the 1st of July reached in the open sea the latitude 76° 35′ north. A little further (12 leagues) they discovered Wostenholme sound, together with the island of the same name. Baffin anchored here, but was compelled to take to the high sea again, on account of the strong current. This sound is described as full of bays and inlets. On the glorious fourth of July, 1616, they discovered Whale sound, latitude 77° 30′ north, so called on account of the vast number of whales which were seen there. They anchored their ship in a small bay, but were driven again to the sea by a violent storm. On July 5, they passed Hakluyt island, between Whale sound and another large sound which stretches north, called Sir Thomas Smith's sound. The ice had meanwhile placed barriers in the way of the ship and caused it to keep its course again more to the south. July 8, the Carey islands were passed, and July 10, Alderman Jones's sound was discovered; a boat was here put out, but stormy weather prevented the intended landing; they followed the coasts stretching to the south, which showed another curving, and on July 12 they discovered Sir James Lancaster sound. On August 30, the expedition returned to the English coasts. As Baffin did not find the hoped-for passage northwest, and as the bay ceased to be visited for a long time, the discoveries of this expedition were much questioned till the labors of Sir John Ross confirmed them.

Commander John Ross sailed to the Arctic regions with two ships, the Isabella and the Alexander, of 385 and 252 tons and 57 and 37 men; the Alexander under the command of Lieutenant W. E. Parry, the great Arctic discoverer of those times. This great expedition, which left the Thames in April, 1818, and returned in November, is especially important, because it opened the long series of Arctic explorations which has characterized our century. It gave us also a valuable survey of the whole of Baffin's bay and Davis's straits, as well as many interesting observations. If the government and geographers of England were not entirely satisfied with the results of the expedition, they were in fact right, if they supposed that Ross had been wanting in boldness. He did not explore any of the sounds he discovered, because ice navigation at that time was full of dangers and uncertainties. Ross was certainly not a Baffin, remaining as he did with his strong and excellent ship below the most northern point which Baffin had reached with his small cutter. He certainly injured his fame not only by keeping away from the sounds and inlets, but by describing them and mapping them down as closed creeks. In general the results of the expedition are especially interesting, as bringing the first news of that most northerly race of Esquimaux who inhabited Hayes's peninsula, and as recording observations, not attempted since, on the depth of the sea. Ross, a native of Scotland, named the country between Melville bay and Whale sound Arctic Highlands.

The next expedition is that of Commander Inglefield, in 1852. Those under Saunders, Austin, and Ommanney do not come under our consideration.

Inglefield's expedition in his small vessel, with brilliant results, reminds one of the bold voyage of the old Bylot with his smart pilot, Baffin. The object of the voyage was to carry provisions to Franklin's squadron, and to examine the northernmost sound of Baffin's bay and its whole western coast for traces of this party. All this was effected in the short space of four months, the ship sailing on the 4th of July and returning on the 10th of November. The vessel was a small screw steamer of 149 tons, with a 16 horse power engine, which, however, was of little use. The party consisted of 17 men all told. On the 20th of August, Inglefield reached Cape York, landed on the 21st at the Esquimaux settlement at Petowack Glacier, on the 23d reached North Star bay,

and on the 27th Smith's sound, in latitude 78° 28′ 21″, where an entirely open sea, almost void of ice, lay before him; a violent storm and the advanced season, however, made it seem advisable to him to turn southward. On September 1 he sailed far into Jones's sound, to 84° 10′, and on the 2d of the month he turned to Lancaster sound. Inglefield was a very able, cultivated, and energetic officer, and during the two weeks that he spent in this region he made some valuable observations and surveys. With the uninterrupted daylight of the Arctic summer, he allowed himself but little sleep, and worked almost continually on deck with the sextant. Although these observations have the value of a running survey only, yet Inglefield's successors, Kane and Hayes, repeatedly bear witness to their general accuracy. The west coast, between Smith's and Jones's sounds, could be less exactly fixed, as the vessel had to contend with adverse winds, storms, and ice; and here Hayes's chart gives a quite different delineation. Inglefield first pointed out the fact that these sounds were broad sea-roads, and that Whale sound was at least a great inlet, all of which were, at times, free from ice. Besides topographical surveys, they made also meteorological, botanical, zoological, and geological investigations of paramount value, so that their unpretending work is one of the most important in the department of Arctic literature. At the side of Inglefield stands Dr. P. C. Sutherland, one of the most scientific men who have visited the Arctic world on the American side. Inglefield's enticing description of his entrance into Smith's sound, with the open water free from ice and extending without limit to the north, did not remain without effect on his contemporaries. His expedition, prolific in result, was also rich in promise, and excited many navigators to enterprising voyages, and especially gave rise to one of the most remarkable Polar expeditions known—that of Dr. E. K. Kane.

From the moment of Captain Inglefield's return, we had the idea that Smith's sound might be connected with the great Polar basin upon Spitzbergen, Siberia, and attempted to show that the portion of the sea which stood in connection with it could be but of small extent, and not the broad Polar sea.[1] The hopes of making great discoveries were doubtful, wherefore a greater obligation is due to Kane and Hayes, who, in spite of all difficulties, extended our geographical knowledge in this direction.

Kane's expedition left New York in the brig Advance, of 146 tons, and with a crew of eighteen men, on the 30th of May, 1853. It returned there after unspeakable privations and sufferings, (leaving behind them their ship and three men who had died, and also a scientific collection,) on October 11, 1855.

The vessel reached Cape York on the 4th of August, 1853, Smith's sound on August 6, when immense masses of ice offered invincible barriers to any extended progress. With the utmost exertion, and in the midst of great danger, Kane advanced about eight German miles in fourteen days. He arrived at Rensselaer bay, where he was fated to be imprisoned by the ice for three-quarters of a year. This spot has become famous by the two winters that Kane and his party spent there It is the coldest spot ever inhabited by Europeans for so long a period, and their abode there forms a drama which not only intensely excites general interest, but is a high triumph of human energy in the conflict with the horrors of a frigid climate.

From his winterquarters Kane arranged various sledge journeys, consisting of parts of his men, to push further north on the ice. The most important of these expeditions were those conducted by Dr. Hayes in May and by Morton in June. In the former the coasts of Grinnell land to 80° north latitude were visited, and in the latter the Greenland coast to 80° 50′ north latitude was surveyed, Kennedy channel discovered, and the western coast, as far north as latitude 82° 10′, was sighted and mapped down. Morton's supposed discovery of a

[1] A. Petermann. London Athenæum, 11th Dec., 1852, p. 1359.

Polar sea, upon which so much weight has been laid, we opposed, in accordance with the views of Inglefield, and the later discoveries of Hayes only confirm our opinion. While the expeditions of Baffin, Ross, and Inglefield consisted of short summer passages, that of Kane is the first in which Europeans lived through the winter in these high latitudes, and could thus observe all the phenomena of nature there. As to the surveys of Kane's expedition, they do not come up to the expectations which we might form of them, either in extent or exactness. Not that the observations were not earnestly and faithfully carried on, but the mode of travelling and of making investigations on sledges offered immense difficulties, and the explorers might well feel happy that they came back with their lives. The part most accurately surveyed is that near Rensselaer bay, the more northerly parts being very uncertain. Thus, Kennedy channel is really 20 miles further south than Kane puts it. The following results are those which are the most valid:

	North latitude.			West longitude from Greenwich.		
	°	′	″	°	′	″
Rensselaer harbor	78	37	4	70	52	45
Cape Alexander	79	9	18	74	20	
Littleton island	78	22	6	74	10	
Fog island	78	32	39	73	50	
Bedevilled reach	78	34	6	72	55	
Marshall bay	78	51	6	68	54	
Cape Wood	78	59		68	20	
Caché inlet	79	12	30	65	30	
Cape Jackson	80	1	36	66	52	
Cape Madison	80	20	12	66	52	
Cape Jefferson	80	41	12	67	52	
Cape Prescott	79	35	12	72	56	
Cape Frazer	79	42	54	71	30	

We shall see further on how these results are modified by Hayes's observations.

All the charts and maps of the Kane expedition are miserably executed; the best is by Schott, but the most perfect are insufficient. The nomenclature does not agree with that of the text, and the topography is incorrectly delineated.

Dr. Hayes with his party left Boston July 6, 1860, and returned in the middle of October, 1861. The ship was the schooner "United States," of 133 tons, the crew in all numbered 18 men. Cape York was reached on the 25th of August, and the entrance to Smith's sound by Cape Alexander on the 26th of August; there the same difficulties opposed this expedition as opposed that of Kane seven years before: they were assailed by violent storms and obstructed by ice masses. Hayes sailed only as far as latitude 78° 30′, which is about the same as the northing of Inglefield's voyage. He was obliged to make winter-quarters in a harbor named Port Foulke, (latitude 78° 17′ 30″,) until July 14, 1861.

Two important excursions were made by the expedition, both under Dr. Hayes's personal guidance; one on foot in October, 1860, upon the huge Glaciers about 18 German miles wide in the interior of Greenland; the other with sledges and dogs in April and May upon the hard frozen sea to 81° 35′ of north latitude. With all his exertion Hayes could only effect the confirmation of Kane's discoveries.

Long before Hayes's departure we earnestly protested against the assumptions and hypotheses on which he based his success, and we declared that the way

proposed by him to reach the north pole was the most unfavorable of all the ways thought of. Our predictions have been confirmed by this expedition. The learned world in America are to blame for thus persisting in untenable views. Hayes's results, although exceedingly small in respect to the appointed end—the reaching of the pole—deserve the greater acknowledgment because they were obtained under so much greater difficulties We understand from private letters that Dr. Hayes has made comparatively comprehensive surveys and measurements which greatly modify the details of former charts. These labors are in the hands of the Smithsonian Institution, to whom we must look for an early publication. The most interesting is the new description of the coasts of Grinnell land. So far as these have been reconnoitred by Dr. Hayes in May, 1854, they obtain a more northerly point; so far as they were seen by Morton they remain substantially the same, but are more indented in their character. Smith's sound and its surroundings are with Hayes essentially different from all other surveys. The whole western coast between Smith's sound and Jones's sound goes further to the east, and assumes quite a different form. Hayes's observations were made under more favorable circumstances than those of Inglefield; and so, too, in Whale sound, what Inglefield marked as islands Hayes found, in two instances, to be capes. Hayes gives names to some of his own discoveries as well as to localities before known. One sound he names after his ship, and the great basin of the north he names, very properly, "Kane Basin." We suggest, as a good name for that point of land, the southern part of which was called by Ross, Arctic highlands, but which has no general name, the term "Hayes's Peninsula," after the man to whom geography owes the most about Arctic regions, he being the only explorer who has reconnoitred the far interior. It is the privilege of discoverers to name the countries they find, but is especially their right when they have undergone so many hardships as those which Kane and Hayes endured. It is therefore absolutely necessary that the faithful map-maker should preserve the names and define their exact extent.

GROUND-RELIEF.—HEIGHT AND DEPTH OF LAND AND SEA.

The whole of this northern territory, like that of southern Greenland, is deeply indented. The coast is precipitous, the land rising to the height of 300 to 1,500 feet above the sea. A hill range follows this steep coast more or less parallel in direction. The Prince of Wales mountain is, according to Inglefield, 2,000 feet high. The most interesting and valuable information in regard to the height of the land is given by Dr. Hayes, who made a tour into the interior. He gives 5,000 feet as the highest point reached by him.

Concerning the depth of the sea, we know just as little, and this little we owe to the expedition of Ross, the only one which seems to have taken soundings. From this we learn that the steep coast has an under-sea continuation, and the northern land of Baffin's bay a flat bottom. Everywhere close by the coast considerable depths were found—100 or 200 fathoms, which do not increase toward the middle of Baffin's bay. Inglefield also tells of a sounding made by him, which gave not less than 145 fathoms. It was close by Cape Alexander, a half a mile from the shore. The greatest depth found by Ross was 455 fathoms in Melville bay. In general, the greatest depths were on the eastern shores, those of Greenland.

THE CURRENTS.—THEIR INFLUENCE ON THE CLIMATE, THE FLORA, THE FAUNA, AND HUMAN EXISTENCE.

The geography and hydrography of the Artic seas are yet waiting for their laborers. At present the currents in Baffin's bay are very imperfectly known, even in regard to the more important and sharply impressed currents. Once it was assumed that a broad and mighty stream of cold water passes through the

whole bay from north to south, and that a contrary current, likewise of cold water, flowed in around the south cape of Greenland, passes up the western side of that island as far as Disco bay, and then ceased. This is not the case. It has been shown that this contrary current is not a cold stream, but a branch of the warm Gulf Stream. This, indeed, was shown by the chart of the Grinnell expedition, which gives two currents—one colder, running from Lancaster sound along the west coast to the south; the other warmer, flowing into Baffin's bay from 50° north latitude and taking its course on the eastern shores of the bay into Melville bay. The line of this latter stream has become, with the ship's sailing to Lancaster sound, the accustomed sailing course. They follow the western coast of Greenland till they reach Wilcox Point, keep from there diagonally through Melville bay to Cape York, follow the 76th parallel of latitude to the west, and strike from the middle of Baffin's bay by degrees into a southwesterly direction. This great circuit, several degrees north of the point arrived at, is taken because they can calculate on finding there an open sea, or at any rate a navigable passage amid the floating ice. This current does not stop at Melville bay, but finding an opposition to the north, (Hayes's peninsula,) it sweeps aside in a westerly direction, crowds back all the icebergs from the northwest and southwest, and thus creates an open and navigable sea—the North Water of the whalers. At this point the stream divides; a part returning southward, is swallowed up by the cold streams from Smith's, Jones's, and Lancaster sounds; a part distinctly pursues its course along the coast of Greenland till the northern outlet of Smith's sound. Even Inglefield, the first sailor of these seas, indicates a strong current which he had followed and observed from Cape York to Cape Hatherton; at the entrance of the sound the current had a rapidity of 72 nautical miles in 24 hours. This became an established certainty by the investigations of Kane and Hayes. To be sure their log-books are not published, nor are there any direct observations on the current, but they relate to things which contain more certain indications of the ocean streams than single direct observations could have. As Inglefield showed, so they prove, that in the navigable water of this warm current in Melville bay they can always go with ease and rapidity into Smith's sound. The whole eastern half of these waters is found navigable always. As to the western shores the case is different; there we find a current from north to south, and a heaping up of drift ice is almost always encountered.

The influence of the warm current is most clearly perceived in Smith's sound itself, in which to the most northerly point the sea is always open and navigable; from that point northward heavy ice-masses are met with, which, at least during the three years of Kane's and Hayes's abode, were so heaped up and solid as to allow of sledge journeys in all directions. The ice limit of Smith's sound is conditioned entirely by the two currents that meet there.

Not merely in summer does this branch of the Gulf Stream remain open and navigable, but also through the winter, however severe it may be, and however massive may be the ice streaming out from the various bays and glaciers. This is certainly the case in the comparatively narrow Smith's sound, where, during a long winter, the sea remained open. The temperature sank below the freezing point of mercury, but the sea remained in the sound unfrozen. Esquimaux are to be found only near the sea, for their existence depends on the walrus, and hence open water.

The effects of the warm stream are most wonderful. Above all it renders human existence possible upon Hayes's peninsula. In the whole archipelago of Parry islands, and in general north of Lancaster sound, no men live. In western Greenland settlements cease at 73° north latitude; above that come the immense uninhabitable glaciers, where the Esquimaux do not even hunt, so full of ice is the sea, and so desolate the frozen tracts; but where the coast bends round to the west and receives the full influence of the warm stream, there at once human beings appear again. There we find that Esquimaux race of Ross,

the "Arctic Highlanders," a strong, hardy race, who conquer the colossal polar bear with their very imperfect weapons, and get the mastery of the quite as powerful and dangerous walrus. Kane found permanent settlements of these Esquimaux as far as Etah, where the warm stream must undeniably maintain its ascendency.

The opposite influences of the two currents can be shown in no better way than by comparing the winter of Kane in Rensselaer bay, where the cold stream prevails, to that of Hayes in Port Foulke, where the warm stream predominates. We regret exceedingly that Hayes's detailed observations on the climate have not been published, so that we could compare by definite figures what is at present proved by all the natural phenomena dependent on climate. During the two years of Kane's abode in the sea named after him, the basin being more than double the width of Smith's sound, the ice never broke up; while at Port Foulke not the slightest quantity of solid ice formed, and, at most, bound together the innermost points of small bays. The Esquimaux, indeed, hunt on the coasts of Kane basin, but never remain there permanently. In opposition to this frozen sea, they call the waters between Smith's sound, Whale sound, and Carey islands, Utlak-soak; that is, cooking-basin, water-kettle. Thus, in the centre of this sea the best developed vegetation is found; here there is always a prodigious amount of sea-animals, and here is the last place of refuge for the whole tribe of natives, when in all other places the hunting is less abundant. On account of the vast numbers of whales here, Baffin and Bylot called it Whale sound; Inglefield saw it swarming with sea-animals. Northumberland island is spoken of by Kane as rich with vegetation, and full of flocks of birds; and Hayes describes the green meadows there as a paradise, the most luxuriant oasis that he saw north of the Danish settlements of South Greenland; and he adds that the sea was filled with immense swarms of whales and walrus, the air with myriads of butterflies. The difference between Kane's and Hayes's winter-quarters was only nine German miles, but the difference in the temperature, animal life, and flora is so great that Kane's expedition would have starved, had it not been for supplies from Etah, the Esquimaux settlement near Port Foulke. The hunting at Rensselaer bay was very insignificant, but at Port Foulke there were great herds of reindeer during the whole winter, and over 200 were killed by Hayes's party. There was thus an excellent supply of fresh meat. There were also hares, foxes, seals, eider ducks, and other birds. The chief winter food of the Esquimaux is the walrus, of which there is a plenty in the open sea near Port Foulke.

For Dr. Kane, who had to struggle so hard with ice and cold in Rensselaer bay, the open sea in Smith's sound was always an inexplicable enigma. He did not think of the currents and their effects, and does not appear to have made any temperature observations on his southward trips. Hayes often speaks of the mild temperatures at Port Foulke with the low temperatures elsewhere. Thus, at the end of November, 1860, the mercury rose to + 32° Fahrenheit, and it rained at the time, which Hayes had never observed in Rensselaer bay, except in the middle of summer. March 16, 1861, the temperature at Carin Point was —68½° Fahrenheit, and at Port Foulke, at the same time, only —27° Fahrenheit, consequently 41½° warmer.

THE GREENLAND REGIONS IN THEIR RELATION TO A NORTH POLE EXPEDITION.

For the more extended exploration of the Arctic regions, and especially for discoveries near the pole, we have always recommended the North European sea, and not Baffin's bay. Our later studies have confirmed our opinion.

Parry, in 1827, reached, in the Spitzbergen sea, the point latitude 82° 45′ north, with sledges, and insisted that a ship could have reached the same latitude without encountering ice. We have just seen that ships can practically

reach only 78° 30′ of latitude in Baffin's bay. The immense hardships of Kane in forcing his vessel a distance of seven German miles in fourteen days through a narrow passage to Rensselaer bay, and his subsequent experience there, show that navigation above the northern outlet of Smith's sound is impossible. Now, this Kane basin is shown to be an immense receiver for all the cold streams. A stream in Kennedy channel, southwards, brings in supplies of ice; a second comes from the west through the United States sound, with another pack; a third ice-supply comes from the great Humboldt glacier on the east; and then there is a good deal of drift-ice from Baffin's bay. Thus, from four sides the ice comes in, is melted a little, freezes again, and becomes an enormous pack of firm, solid, immensely thick surface-ice. And what sort of ice? Not smooth ice, adapted for sledging, but driven together in most rugged ways, forming a magnificent scenery of ice-blocks as high as houses. No wonder that even a Kane and a Hayes could not effect much with their sledges, when the character of the ice and the traversing it is so graphically described by Dodge, Hayes's pilot: "You might as well try to cross the city of New York over the house-tops." However experienced was Hayes in sledging, however great his endurance, his energy, and his resolution, he was not less than thirty-one days in going seventeen miles. He estimated that the windings necessary to avoid the masses of ice would make the distance 125 German miles.

A ship expedition in this direction is impossible, but that alone can give satisfactory and accurate results. The surveys of sledge expeditions are necessarily unsatisfactory. The whole attention must be given to getting ahead and preserving life, so that any connected observations are impossible.

We rejoice that the expedition of Hayes has satisfactorily shown the absurdity of sledge expeditions. It has had the negative advantage of being a warning against similar attempts.

THE OPEN POLAR SEA OF MORTON AND HAYES.

Kennedy channel was seen by Morton in June, 1854, open and free from ice, and it was supposed to be connected with the Polar sea. Hayes reached the western side of the channel by more than half a degree of latitude further north than Morton, and hence his views concerning this contested question are of especial interest. He found by no means an open, still less an ice-free sea, but the channel was completely covered with ice. As he advanced to the north, however, this ice had a more and more friable appearance, and was apparently about breaking up. He reached his most northerly point May 18, Morton his June 25. Hence we may be justified in supposing that between the middle of May and the middle of June, the ice breaks up and the sea would be quite open. But this is a mere supposition, and there are certainly strong reasons for our disbelieving that Kennedy channel is connected with the Polar sea. Our principal reason was and is, the total absence of driftwood in all the waters north of Smith's sound hitherto investigated, whilst everywhere in the department of that central Polar basin immense masses of it are found. Morton's statements concerning a richer animal fauna in the open arm of the sea, visited by him, can decide nothing, since animal life is always found wherever there is open water, even by the chinks in the ice. Hayes by no means confirms these stories of Morton, for he speaks of the vegetation as exceedingly scanty and mean. Neither does he bring forward any new or tenable grounds from which we could justly infer the existence of a larger open sea area. It is not logic, to say nothing more, to believe that that great surface must be exclusively sea because it is unknown. It is certain that of the whole of northern Greenland and Grinnell land, to the latitude of Upernavik, Hayes's peninsula, blessed and enlivened by the warm south stream, is the richest part in animal and vegetable life, and thence it follows that only here have the Esquimaux made stations, while once Grinnell land was inhabited by them, as Hayes has shown. The Esquimaux are

a shiftless people, living as they do from hand to mouth, without laying up provision for the future. Indeed, the Esquimaux would die out even in Germany, as they would find no nourishment in winter, (without laying it up during the summer,) as they certainly do find food in the seas of these regions.

We also assume that Kennedy channel widens northwards a little, but is soon closed by land which lies between it and the north pole. Upon the northern coast of Siberia the north winds in winter bring mild weather and mists, because it comes from what the Russians, referring in some way to a Polar sea, call Polynya. Wrangel observed that the northwest winds, as well as some northeast winds, always brought with them a thick, moist fog, so that the clothes and tent were wet through. This must have been the case, and been so observed at Rensselaer harbor, if, at the north of it, or of Kennedy channel, there was an open sea, or a Polynya; and this so much the more because here there was a regular observatory, in which meteorological observations were made every hour for 20 months. But, on the contrary, it appears that where Kane, Morton, Hayes, and their followers believed there was an open sea, the coldest winds originated, as well as the clearest weather. Kane mentions this especially. Moist, warm winds were observed at Rensselaer bay, and considered very remarkable; but they never came from the north, but always from the southeast. This fact is significant, as tending to disprove the existence of the supposed open water of Kane and Hayes, and as adding a new proof to the prevailing arm of the Gulf Stream in Baffin's bay. It suggests, too, the importance of referring to all the physical elements in the discussion of geographical questions.

In vain we have pointed out for years how necessary, for the solution of the great contested question as to the nature of the central Arctic regions, is one wintering with meteorological observations on the north shore of Siberia. Although there are many who take an interest in the solution of geographical questions, especially of those relating to the polar regions, and many who would gladly sacrifice everything to be instrumental to those solutions, yet our preaching has hitherto fallen upon deaf ears. For us the culmination of the preceding paper is this: if a very small arm of the warm Gulf Stream, working in Baffin's bay beside a powerful cold current, should produce such mighty effects, what must be those of the broad, powerful current in its wider course northeastwards, filling the whole space between Spitzbergen and north Europe? Concerning the ice formation in polar regions the experienced Dr. Hayes remarks, ("Open Polar Sea," page 361:)

With the warm flood of the Gulf Stream pouring northward, and keeping the waters of the Polar sea at a temperature above the freezing point, while the winds, blowing as constantly under the Arctic as under the tropic sky, and the ceaseless currents of the sea and the tide-flow of the surface keep the waters ever in movement, it is not possible, as I have before observed, that even any considerable portion of this extensive sea can be frozen over. At no point within the Arctic circle has there been found an ice-belt extending, either in winter or in summer, more than fifty to a hundred miles from land. And even in the narrow channels separating the islands of the Parry archipelago, in Baffin's bay, in the north water, and the mouth of Smith's sound, everywhere, water will not freeze except when sheltered by the land, or when an ice-pack, accumulated by a long continuance of winds from one quarter, affords the same protection. That the sea does not close except when at rest I had abundant reason to know during the late winter; for, at all times, as the narrative frequently records, even when the temperature of the air was below the freezing point of mercury, I could hear from the deck of the schooner the roar of the beating waves.

The second part of Petermann's article is merely an abstract of Hayes's "The Open Polar Sea."

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NOTE.—Professor Paijkull's "Summer in Iceland" was not received in time for use.

APPENDIX A.

Table of voyages towards the North Pole, compiled by Clements R. Markham, Esq., Secretary to the Royal Geographical Society; copied from the Journal of the Royal Geographical Society of London, volume 36, 1866, *page* 295.

Date.	Captain and ship.	Latitude.	Nature of Observation.	Authority for the statement.	Remarks.
1266	Normans from Gardar, in Greenland.	75° 46′ N.....	On July 25, when on meridian in δ, the sun was not higher than that when a man lay down across a six-oared boat, stretched out towards the gunwale, the shadow formed by the side of the boat nearest the sun reached his face; but at midnight the sun was as high as when it was in the N. W. (highest) in Gardar.	Letter from a Norman named Haldor to another named Arnold.—Antiq. Amer., Royal Geographical Society Journal, vol. 8, p. 127.	Angle formed by gunwale and man's face about 33°, lat. 75°. On July 25, in the 13th century, ⊙ declination was +17° 54′. Inclination of ecliptic, +13° 32′. Gardar is in 60° 55′ N. Height of ⊙ there, when in N. W. at summer solstice, 3° 46′; equivalent to midnight altitude of ⊙ on July 25 in 75° 46′ N., a little north of Barrow's strait.
1607	Henry Hudson	81° 30′	Not stated.....	Asher's Hudson, p. 16.....	"And this I can assure at this present, that between 78½° and 82°, by this way, there is no passage."
1656	Two Dutchmen.....	89° N	Four journals kept in the two ships agreeing within four minutes.	Captain Wood's Voyage, p. 145. Wood said that a Captain Goulden told his majesty so in 1676.	
1664	William de Vlamingh	82° 10′.....	Not stated.....	Commodore Jansen; Royal Geographical Society proceedings, April 10, 1865.	Northwest of Nova Zembla.
1670	A Dutchman	2° beyond the pole.	Not stated.....	Moxon, hydrographer to Charles II., was told so by a sailor in a drinking-shop at Amsterdam, where he went to get a glass of beer.—Harris, vol. 1, p. 616.	
1690	A Dutch ship.....	88° N	The captain would suffer no journal to be made.	The story was told in 1745 by Dr. Dallie, who said he was on board, to Dr. Campbell, the editor of Harris's Voyages. Dallie was in Roggewein's voyage.	Weather warm, sea free from ice, and rolling like the bay of Biscay.
1707	Captain Cornelis Gillis, a Dutchman.	Far beyond 81° N.	Not stated.....	Letter from John Wallig to Messrs. Staphorst in 1775.	
1720	Captain Johnson or Monson.	88° N	Not stated.....	Buffon's Natural History, vol. 1, p. 25. M. de Buffon was told so by a Dr. Hickman in 1730.	Barrington thinks that Dr. Halley engaged Captain Johnson to take one of his thermometers to the North, and that he reached 88°.—Barrington, p. 47.

Table of voyages towards the north pole—Continued.

Date	Captain and ship.	Latitude.	Nature of observation.	Authority for the statement.	Remarks.
1720	Captain Alexander Cluny ..	82° N	Not stated	Barrington, p. 48	A map was engraved under Cluny's directions, with his position on it.
1744	The ship *Captain Guy*	81° 30′ N.....	Observat's of captain and mate.	James Hutton, "a hardy old tar," who was on board.—Barrington, p. 64.	
1746	Captain Andrew Fisher, ship *Ann and Elizabeth.*	82° 34′ N.....	.....	His own statement.	
1751	Captain MacCallam.....	83° 30′ N.....	Observations both with Davis and Hadley quadr's.	Story of a Mr. Watts, (who was aged 17 when on board;) told 20 years afterwards, the captain being dead.	Sea open to the north; not a speck of ice for the last three degrees.
1752	Captain John Phillips, ship *Loyal Club.*	81° N	Observation.	His own statement.....	He said it was *very common* to fish in such latitudes.
1754	Captain James Wilson, ship *Sea Nymph.*	82° 15′ N.....	Observation of Mr. Ware, the mate.	Mr. Ware's statement.....	Sea perfectly clear.
1754	Captain Guy, ship *Unicorn.*	83° N., June 4 82° 3′ N., J'e 5.	Observations of ⊙.	Statement of a Mr. Adams, who was on board.	Captain Guy's 59th voyage to those seas.
1756	Captain Jas. Montgomery, ship *Providence.*	83° N	Observation	His own statement.	
1760	Captain Humphrey Ford, ship *Dolphin.*	81° N	Not stated.....	His own statement.	
1765	Captain Vassili Tcitschagoff	80° 30′ N.....	Observation of ⊙..	Pallas.....	This was an expedition sent by the Russian government to Spitzbergen.
1766	Captain Robinson, ship *Reading.*	82° 30′ N.....	D. R., computed by the run back to Hackluyt head in 24 hours.	His own account to Mr. Barrington.....	Sea open. He thought he could have reached 83°.
1766	Captain Jonathan Wheatley, ship *Grampus.*	81° 30′ N.....	Not stated.....	His own account.....	Three Dutch captains told him they had been to 89° N.
1768	David Boyd, brig *Betsy.*	82° N	D. R.....	His own statement; he was the mate	Driven up by a gale of wind; beset.
1773	Captain Ralph Dale, ship *Ann and Elizabeth.* *	81° N	Not stated.....	His own account.....	Found much ice.
	Captain John Greenshaw ..	82° N	Not stated.....	.....	Nothing but a solid body of ice west of Spitzbergen. He said that Captain John Cracroft, in the South Sea Company's time, was once so far as 83° N.
1773	Captain Robinson, ship *St. George.*	81° 16′ N.....	Observat'n by Hadley's quadrant, very accurate.	.....	He afterwards pursued a whale for five hours north, so that he thinks he reached 81° 31′ N., longitude 8° E. Sea open to E. NE.
1773	Captain John Clarke, ship *Sea Horse.*	81° 30′ N.....	D. R.....	.....	Open sea to the north, with a heavy swell from northeast.
1773	Captain Bateson, ship *Whale*	82° 15′ N.....	D. R.....	Bateson's Journal.....	"A very able sea officer is satisfied with the accuracy of his account."—Barrington, p. 74.
1773	Captain Phipps, Captain Lutwidge, H. M. S. *Racehorse,* H. M. S. *Carcass.*	80° 48′ N.....	Observation	Phipp's Voyage towards the North Pole.....	The expedition was sent out on the suggestion of the Royal Society and Mr. Barrington. It was found impossible to penetrate the ice north of 81°. The ice was a continued, smooth, unbroken plain to the horizon.

1774	Captain John Reed, ship *Rockingham.*	81° 42′ N.....	Not stated.....	His own account.....	A Dutch captain, named Hans Derrick, told him that he, with five ships in company, had been to 86° N.
1806	Captain Scoresby, ship *Resolution.*	81° 12′ 42″ N., 81° 30′ N., (5° 10′ from the pole.)	Observation of ⊙, D. R.	My father, p. 161	Navigation quite open to E. NE for many leagues.
1818	Captain Buchan, Lieutenant Franklin, H. M. S. *Dorothea*, H. M. S. *Trent.*	80° 34′ N.....	Observation of ⊙..	Barrow, pp. 56—73	Stopped by the ice.
1823	Captain Clavering, H. M. S. *Griper*; and Captain Sabine.	80° 20′ N.....	Observation of ⊙..	Barrow, p. 130.....	On the east coast of Greenland, in 75° 12′ N., they saw the high land due north as far as 76° N. Coast 3,000 feet high, with higher mountains inland.
1827	Captain Parry, H. M. S. *Hecla*; boats *Enterprise* and *Endeavour.*	82° 45′ N.; 19° 25′ E.	Observation of ⊙..	Barrow, p. 303	The commissioners of longitude, in the memorial to the king, were of opinion that *there was no well authenticated account of any ship having gone further north than* 81°, except Scoresby.
1853 to 1855	Dr. Kane.....	80° 40′ N.....	(?) meridian altitude of ⊙ according to Morton.	Statement of Morton, the steward, who said he saw land as far as 82° 30′ N, June 21 to 24.—R. G. S. Journal, vol. 28, p. 283, note.	See Dr. Rink's arguments against Kane's polar sea, in the Royal Geographical Society Journal, vol. 28, p. 272, *et seq.*
M'y 18 1861	Dr. Hayes.....	81° 35′ N.....	Observation of ⊙..	The open Polar Sea, p. 351.....	On the west coast of Kennedy channel.

The usual Spitzbergen fishing-ground in the last century appears to have been between 78° and 80° north. The Dutch skippers replied to Mr. Barrington, in 1774: "We can seldom proceed much higher than 80½° north, but almost always to that latitude."

APPENDIX B.

Table showing some Thermometrical Observations taken in the Arctic regions, arranged according to latitude.

[Taken from the Journal of the Royal Geographical Society of London, volume 22d, 1852, page 118, "Notes on the Distribution of Animals available as Food in the Arctic Regions." By Augustus Petermann, Esq., F. R. G. S., &c.]

Locality.	Latitude north.	Longitude west; long. east when dash is prefixed.	Elevation, feet.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter.	Spring.	Summer.	Autumn.	Year.	Difference of the hottest and coldest months.	Difference of summer and winter.	No. of years.	Hours of observation.	Authorities.
Lat. 80° to 75°.	° ′	° ′		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°			
Spitzbergen	80 00	— 10 00	.....	.....	.....	.....	.....	.....	34	36	34	....	.....	.....	.....	.....	.....	35	....	.....	.....	....	4 mos.	2-hourly.	...
Hekla Cove	79 55	16 49	.....	.....	.....	.....	.....	.....	36	40	38	....	.....	.....	.....	.....	.....	38	....	.....	.....	....	.....	hourly.	...
Greenland Sea	78 00	16 49	.....	.....	.....	.....	14	23	31	37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	3	d. extr.	...
Wolstenholme Sound	76 33	30 00	.....	—25	—34	—17	— 4	26	40	41	34	27	11	—19	—27	—29	2	38	7	5	75	66	1	6 times.	R.
Lat. 75° to 70°.																									
Melville Bay, (Green'd)	74 47	110 48	.....	—31	—32	—18	— 8	17	36	42	33	23	— 3	—21	—22	—28	— 3	37	0	1	75	66	1	2-hourly.	...
Assistance Bay	74 40	94 16	.....	—29	—30	—22	— 3	12	34	38	86[1]	21	1	— 7	—21	—27	— 4	36	5	2	68	63	1	3-hourly.	S.
Nova Zembla, (1)	74 00	58 00	.....	9	10	10	11	24	34	38	38	31	24	10	10	10	15	37	21	21	28	27	1	2-hourly.	...
Port Bowen	73 14	88 56	.....	—29	—27	—28	— 6	18	36	37	31	29	11	— 5	—19	—25	— 6	34	11	4	65	59	1	2-hourly.	...
Nova Zembla, (2)	73 00	— 57 20	.....	4	— 8	4	8	20	35	40	41	31	22	9	— 3	— 2	11	38	21	17	49	41	1	2-hourly.	...
North Cape	71 10	— 26 01	.....	22	23	25	30	34	40	47	44	38	32	26	26	24	30	43	32	32	25	20	1	.....	...
Kovennoi Filipovskoi	71 05	—118 00	.....	.....	.....	.....	— 4[2]	16	35	49	51	27	19[3]	.....	.....	.....	.....	45	.....	.....	.....	.....	6 mos.	.....	M.
Ustyansk	70 58	—138 24	.....	—39	—31	— 4	7	28	48	59	45	18	—19	—25	—37	—36	10	50	9	4	98	86	2	8, 12, 4, 12	...
Nova Zembla, (3)	70 37	— 57 47	.....	— 3	0	—11	3	18	33	36	38	30	20	3	12	3	3	35	18	15	48	32	1	2-hourly.	...
Lat. 70° to 65°.																									
Boothia Felix	69 59	92 01	.....	—29	—32	—28	— 3	16	34	41	39	25	9	— 5	—22	—28	— 5	38	10	4	73	66	2½	hourly.	...
Igloolik	69 21	81 53	.....	—16	—20	—19	— 1	25	32	39	34	25	14	—19	—28	—31	2	35	7	6	67	56	1	2-hourly.	...
Nishne Kolymsk	68 32	—160 56	.....	—31	—23	— 7	16	43	50	61?[4]	....	21	0	—17	—24	—26	17	....	2	....	92?[4]	....	2	8, 8	...
Kotzebue Sound	68 00	163 00	.....	.....	.....	.....	.....	.....	.....	52	43	34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3 mos.	d. extr.	...
Fort Confidence	66 54	118 49	500	—22	—22	—20	— 5	.....	.....	.....	.....	.....	19	— 4	—39	—27	.....	.....	.....	9?	.....	.....	7 mos.	15 to 17 times	R.
Fort Hope	66 32	86 56	.....	—29	—27	—28	—24	18	31	41	46	29	13	1	—19	—25	— 5	40	14	6	76	65	1	8 times.	R.
Eyjafjördbr, Iceland	66 30	20 30	.....	26	18	21	27	36	44	47	47	43	34	26	18	21	28	46	34	32	29	25	2	.....	...
Winter Island	66 11	83 11	.....	—23	—24	—11	6	23	23	35	37	32	13	8	—14	—20	6	32	18	9	61	52	1	2-hourly.	...
Yukon	66 00	147 00	200?	—27	—26	—11	13	41	53	66	60	39	22	— 8	—18	—24	57	15	17	15	93	81	1	6, 6	R.
Fort Franklin	65 12	123 13	500	—23	—17	— 5	12	35	48	52	51	41	22	0	—11	—17	50	13	21	18	74	67	2	6 times.	R.

Lat. 65° to 60°.																								
Archangel	64 32	— 40 33	.....	7	9	22	31	42	55	61	58	48	35	23	13	9	32	58	35	34	55	48	18	7, 2, 9	...
Fort Enterprise	64 28	113 06	850	—16	—26	—13	6	31	.....	.....	.....	32	22	— 2	—31	—24	55?	23	17	18	87?	79?	3	.....	R.
Godthaab	64 10	52 24	.....	12	13	16	22	32	39	42	41	36	30	22	17	14	23	41	29	27	30	26	13½	10, 80	...
Neu Herrnhut	64 10	52 40	.....	9	22	22	25	32	40	40	37	34	33	16	12	14	26	39	26	27	31	24	1	.....	...
Reykjavík, Iceland	64 08	21 55	.....	30	28	30	36	45	52	56	53	46	37	30	29	29	37	54	38	39	28	24	14½	d. extra.	...
Fort Reliance	62 46	109 00	650	—25	—19	— 6	8	36	.....	.....	.....	.....	21	13	—17	—17	.....	12	.....	16?	.....	.....	8 mos.	5 times.	R.
Yakutsk	62 01	—129 44	.....	—45	—29	— 6	16	37	58	69	58	44	17	—22	—35	—36	16	62	13	13	114	98	2	5 times.	...
Fort Simpson	61 51	121 51	400	—13	— 9	6	26	48	64	61	54	49	24	9	— 8	—10	59	27	27	26	76	69	2½	8, 8	R.
Pelly Banks	61 30	130 00	1, 400	—22	—15	— 1	20	.....	.....	.....	.....	.....	.....	.....	—14	—17	.....	.....	.....	.....	.....	.....	5 mos.	3 times.	R.
Fort Resolution	61 10	113 51	500	0	—26	10	13	40	.....	.....	.....	.....	26	12	— 3	— 8	.....	21	.....	21?	.....	.....	8 mos.	8, 8	R.
Lichtenau	60 35	46 00	.....	20	23	28	32	39	43	45	41	40	36	26	22	22	33	43	34	33	26	41	2	.....	...
Lat. 60° to 55°.																								
Friedrichsthal	60 00	45 00	.....	20	19	22	27	.....	.....	.....	.....	.....	32	35	30	23	.....	.....	.....	.....	.....	.....	1	.....	...
Petersburgh	59 56	— 30 18	.....	15	19	25	37	49	60	64	61	51	41	30	23	19	37	62	41	40	49	43	13	7, 2, 9	...
Fort Churchill	59 02	93 10	20	—21	— 7	— 5	16	22	45	57	53	36	26	3	—14	—14	52	13	22	18	78	66	1	3 times.	...
Fort Chipewyan	58 43	118 20	700	— 9	— 4	3	20	45	55	63	58	44	33	19	3	— 3	59	23	32	28	72	62	3½	8, 8	...
Hebron	58 00	64 00	.....	— 5	— 5	5	17	33	37	44	49	39	29	24	5	— 2	18	43	31	23	54	45	2	.....	R.
Okak	57 30	66 00	.....	2	2	8	29	38	45	52	52	44	31	22	8	4	25	49	33	28	60	....	2	8, 12, 4, 8	...
Nain	57 10	61 50	.....	1	4	8	30	36	43	50	51	45	34	27	7	4	25	48	35	28	50	44	3	8, 12, 4, 8	...
Sitka	57 03	135 18	.....	34	34	38	41	48	54	57	58	56	47	43	36	35	42	56	48	45	24	21	2½	red.	...
York Factory	57 00	92 26	20	— 5	— 7	5	19	34	48	60	55	42	33	25	4	— 3	19	52	33	26	67	55	1	3 times.	R.
Lat. 55° to 40°.																								
Oxford House	54 55	96 28	400	—22	— 2	9	29	38	.....	.....	.....	.....	18	13	—23	— 1	8	.....	.....	.....	.....	.....	8 mos.	7, 8	R.
Cumberland House	53 57	102 17	.....	—13	— 1	12	35	50	59	62	56	47	37	13	3	— 4	32	59	32	30	75	63	1	.....	...
Iluluk	53 52	166 25	.....	34	32	32	34	39	45	50	55	54	43	35	34	34	35	50	37	39	23	16	1½	8, 1, 9	...
Rupert House	51 21	83 40	20?	— 4	— 1	8	21	42	.....	.....	.....	.....	35	23	16	0	1	.....	.....	.....	.....	.....	8 mos.	3 times.	R.
St. John's	47 34	52 28	.....	23	21	24	33	39	48	56	58	53	44	34	25	23	32	54	44	38	37	31	5	d. extra.	...
London (for comp'rison)	51 30	0 05	.....	37	40	42	47	53	59	62	62	57	51	44	40	39	48	61	51	50	25	22	65	red.	T.

NOTE.—In order to simplify the table we have given the *whole number* of degrees of temperature instead of adding the fractions of degrees given in the original table. The degrees are of the Fahrenheit scale.

R.—Richardson's, "Boat Voyage through Rupert's Land."
S.—Sutherland, "Journal of a Voyage to Baffin's Bay and Barrow's Straits."
M.—Middendorf, "Reise in den äussersten Norden und Osten Sibiriens."
T.—Transactions Royal Society.
The rest of the observations are from Dove, (17th and 18th Reports British Association, 1847-'48.)

[1] From observations to the 10th August only. [2] 25-30 April. [3] 1-26 October. [4] By interpolation.

APPENDIX C.

The following tables, excepting in part No. 3, are compiled from the minute returns made to the Danish government, which are given in the *Meddelelser fra det Statistiske Bureau*, published at Copenhagen. We have been able to consult vols. i–vi (years 1852–'61) of this valuable publication.

Ólsen's map is followed, as elsewhere in this report, in the spelling of Icelandic names. For the meaning of these names, see P. and Z., pp. 479, 480.

No. 1.—*Table showing the population of Iceland on the 1st February, 1850, and on the 1st October, 1855.* (Meddel., vol. iv, p. 3.)

Districts.	Number of families.		Population.		Increase, in hundredths.
	1850.	1855.	1850.	1855.	
SOUTHERN AMT.					
Reykjavík	219	250	1,149	1,354	17.84
Gullbríngu and Kjósar Sýsle,[1] exclusive of Reykjavík	783	853	4,519	4,853	7.39
The same, including Reykjavík	1,002	1,103	5,668	6,207	9.51
Borgarfjardhar Sýsla	329	355	2,097	2,312	10.25
Árness Sýsla	723	755	5,018	5,382	7.25
Rángárvalla Sýsla	700	717	4,766	4,917	3.17
Austr and Vestr Skaptafells Sýsle[1]	481	529	3,340	3,545	6.14
Vestmannaeyjar[2] Sýsla	91	98	399	447	12.03
Total, (southern amt)	3,326	3,557	21,288	22,810	7.15
WESTERN AMT.					
Mýra and Hnappadals Sýsle[1]	379	383	2,410	2,569	6.60
Snæfellsness Sýsla	512	526	2,684	2,825	5.25
Dala Sýsla	267	277	1,923	2,104	9.41
Bardhastrandar Sýsla	336	347	2,518	2,703	7.35
Ísafjardhar[3] Sýsla	508	545	4,204	4,589	9.16
Stranda Sýsla	179	190	1,373	1,572	14.49
Total, (western amt)	2,181	2,268	15,112	16,362	8.27
NORTHERN AND EASTERN AMTS.					
Húnavatns Sýsla	556	639	4,117	4,637	12.63
Skagafjardhar Sýsla	626	622	4,033	4,258	5.58
Eyjafjardhar Sýsla	625	638	3,965	4,289	8.17
Nordhr and Sudhr Thingeyjar Sýsle[1]	640	684	4,453	5,108	14.71
Nordhr Múla Sýsla	405	473	3,201	3,754	17.28
Sudhr Múla Sýsla	391	416	2,988	3,385	13.29
Total, (northern and eastern amts)	3,243	3,472	22,757	25,431	11.75
Total for all Iceland	8,750	9,297	59,157	64,603	9.21

[1] Separated on Ólsen's map. [2] Apparently-combined with Rángárvalla Sýsla on Ólsen's map.
[3] Sub-divided into north and west by P. and Z., p. 480; Mck., p. 281.

No. 2.—*Distribution of the population of Iceland according to ages in* 1855. (Meddel., vol. iv, p. 7.)

Ages.	Per cent.	Ages.	Per cent.
Under 20 years	42.315	Between 50 and 60 years	9.303
Between 20 and 30 years	19.485	Between 60 and 70 years	5.413
Between 30 and 40 years	11.886	Over 70 years	2.463
Between 40 and 50 years	9.135		

No. 3.—*Population of Iceland in several different years.*

Year.	Number.	Authorities.	Year.	Number.	Authorities.
1703	50,444	1 2 3	1840	57,094	1
1769	46,201	1 2 3	1842	53,000	2
1783	47,287	2 3	1845	58,558	1
1786	38,142	2	1850	59,157	1 6
1801	47,207	3 4	1855	64,603	6
1806	46,349	2 5	1857	66,929	2
1808	48,063	2 3	1858	67,847	2
1835	56,035	1			

[1] Meddel., vol. ii, p. 70.
[2] P. and Z., p. 483.
[3] Mck., p. 281.
[4] Given 47,240 by P. and Z., p. 483.
[5] Assigned to 1804 by Mck., p. 281.
[6] Meddel., vol. iv, p. 3.

No. 4.—*Table showing the means of support of the population of Iceland on the 1st October*, 1855. (Meddel., vol. iv, pp. 52–63.)

OCCUPATIONS.	PROVIDING SUPPORT.			SUPPORTED.						TOTAL.			Percentage of population.
				Wives and families.			Servants.						
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	
Ecclesiastics and teachers	196	7	203	399	623	1,022	527	613	1,140	1,122	1,243	2,365	3.66
Civil officials and employés	45	2	47	74	105	179	105	123	228	224	230	454	0.70
Persons who live on their means	81	89	170	40	84	124	18	44	62	139	217	356	0.55
Men of science and letters	29	0	29	20	42	62	20	29	49	69	71	140	0.22
Persons who live by agriculture	7,063	618	7,681	11,835	19,354	31,189	6,112	7,493	13,605	25,010	27,465	52,475	81.23
Persons who live by the sea	980	86	1,066	1,090	1,925	3,015	465	509	974	2,535	2,520	5,055	7.82
Mechanics	199	27	226	133	219	352	59	73	132	391	319	710	1.10
Traders and innkeepers	87	4	91	136	231	367	117	155	272	340	390	730	1.13
Persons who work by the day	172	62	234	97	168	265	13	11	24	282	241	523	0.81
Others who pursue no definite occupation	162	123	285	67	172	239	20	42	62	249	337	586	0.91
Receiving alms	497	710	1,207	0	0	0	0	0	0	497	710	1,207	1.87
Prisoners	2	0	2	0	0	0	0	0	0	2	0	2	0.00
Total	9,513	1,728	11,241	13,891	22,923	36,814	7,456	9,092	16,548	30,860	33,743	64,603	100.00
Percentage of population	14.7	2.7	17.4	21.5	35.5	57.0	11.5	14.1	25.6	47.8	52.2	100.0	.....

No. 5.—*Table showing the population of the Danish colonies of Greenland on the 1st October*, 1855. (Meddel., vol. iv, p. 155.)

Colonies.	Europeans.	Natives and half-breeds.	Total.	Colonies.	Europeans.	Natives and half-breeds.	Total.
NORTH GREENLAND.				SOUTH GREENLAND.			
Godhavn	18	291	309	Julianehaab	38	2,561	2,599
Egedesminde	17	856	873	Frederikshaab	8	708	716
Christianshaab	14	462	476	Fiskernæsset	15	422	437
Jacobshavn	22	336	358	Godthaab	33	836	869
Rittenbenk	11	375	386	Sukkertoppen	16	768	784
Omanak	23	672	695	Holsteinborg	10	837	847
Upernavik	23	524	547	Total for South Greenland.	120	6,132	6,252
Total for North Greenland.	128	3,516	3,644	Total for all Greenland	248	9,648	9,896
				Total December 31, 1845	234	8,501	8,735

No. 6.—*Table showing the means of support of the population of Greenland 1st October*, 1855. (Meddel., vol. iv, p. 174.)

Employments.	Europeans.	Natives and half-breeds.	Total.	Employments.	Europeans.	Natives and half-breeds.	Total.
The royal (Lutheran) mission—				In the employ of the trading com'y—			
Missionaries, catechists, &c	11	133	144	Inspectors, assist'ts, mechanics, &c.	132	142	274
Wives, children, servants, &c	26	414	440	Wives, children, servants, &c	49	925	974
Total	37	547	584	Total	181	1,067	1,248
The Moravian mission—				Supported by hunting and fishing—			
Missionaries and catechists	13	31	44	Working men	0	1,745	1,745
Wives, children, servants, &c	18	182	200	Wives, children, servants, &c	0	6,075	6,075
Total	31	213	244	Total	0	7,820	7,820
				Total	[1]249	[1]9,647	9,896

[1] Not in perfect agreement with table No. 5.

APPENDIX D.

Table illustrative of the political economy of Iceland in 1804, *(taken from Mr. Stephenson's* 18*th Century,) copied from Sir George Steuart Mackenzie's Travels in Iceland.*

Name of District.	Population.	Working men.	Hired servants.	Cows.	Heifers with one calf.	Bulls and oxen.	Calves.	Milch ewes.	Rams and wethers above one year old.	Rams, ewe lambs, and wethers of one year old.	Lambs.	Horses and mares broken in.	Horses and mares not broken in.	Colts and fillies.	Boats with eight and ten oars.	Boats with four and six oars.	Small boats.	Number of gardens in use.
SOUTHERN AMT.																		
Austr Skaptafells Sýsla	853	94	11	391	34	29	56	2,241	408	1,154	2,024	615	97	78	.....	19	.....	5
Vestr Skaptafells Sýsla	1,499	224	17	747	102	150	116	3,230	371	1,989	3,153	1,209	323	135	4	1	3	13
Westman Islands	157	42	5	39	8	1	.....	268	88	165	225	39	1	.....	2	11	3	1
Rángárvalla Sýsla	3,854	358	48	2,074	251	174	325	8,079	744	3,750	7,479	2,889	949	468	9	8	2	23
Árness Sýsla	4,398	505	105	2,371	336	176	375	8,550	700	2,944	7,050	2,886	551	255	35	30	21	17
Gullbringu Sýsla	2,866	915	739	490	36	6	50	1,022	140	500	974	715	38	30	9	225	252	139
Kjósar Sýsla	1,088	135	37	444	31	110	109	1,449	244	979	1,487	469	203	94	2	16	31	13
Borgarfjördhr Sýsla	1,796	260	130	764	69	94	120	3,870	426	1,841	3,250	900	249	125	3	25	88	9
WESTERN AMT.																		
Mýra and Hnappadals Sýsle	1,924	276	41	701	94	55	113	3,898	372	1,697	2,929	1,112	218	105	1	19	17	9
Snæfellsness Sýsla	3,541	346	598	671	55	16	56	1,995	339	214	1,671	670	92	27	67	118	50	8
Dala Sýsla	1,506	128	41	408	50	18	60	1,662	218	867	1,471	543	173	58	10	31	5	1
Bardhastrandar Sýsla	2,225	448	123	665	61	31	76	3,374	610	1,809	2,443	550	45	25	4	115	90	17
Ísafjördhr Sýsla	3,887	418	60	965	62	46	84	6,182	1,911	4,048	5,562	493	54	39	41	119	129	16
Stranda Sýsla	895	89	26	201	4	4	16	2,489	35	255	942	324	7	8	.....	30	67	.....
NORTHERN AND EASTERN AMTS.																		
Húnavatns Sýsla	2,873	260	79	894	87	52	86	11,310	479	2,620	4,370	1,885	294	137	.....	42	3	1
Skagafjördhr Sýsla	3,080	209	29	1,086	114	29	52	9,598	641	2,299	1,322	1,462	432	165	8	40	17	2
Eyjafjördhr Sýsla	3,234	189	128	1,012	74	22	116	9,115	263	1,842	6,069	1,241	177	109	10	56	20	9
Thingeyjar Sýsla	2,928	246	43	677	29	28	74	10,013	616	3,106	3,217	945	38	32	2	68	55	.....
Nordhr Múla Sýsla	1,845	285	30	475	28	52	75	8,039	1,116	3,735	6,549	733	71	73	1	40	11	2
Sudhr Múla Sýsla	1,900	365	59	520	31	39	83	5,921	1,082	2,910	4,779	663	97	79	.....	55	23	8
Total	46,319	5,792	2,349	15,595	1,556	1,132	2,042	102,305	10,803	38,724	66,966	20,373	4,109	2,042	208	1,068	887	293

APPENDIX E.

No. 1.—*Table of exports from Iceland in the year* 1806, *copied from Sir G. S. Mackenzie's Travels in Iceland.*

	Fish.	Dried stock-fish.	Salted cod.	Salted cod.	Cod oil.	Shark oil.	Seal oil.	Fish liver.	Tallow.	Salt'd salmon.	White wool.	Mixed wool.	Woolen yarn.	Pairs of stock-ings.
	Sklb. L. lb.	*Sklb. L. lb.*	*Bbls.*	*Sklb. L. lb.*	*Bbls.*	*Bbls.*	*Bbls.*	*Bbls.*	*Sklb. L. lb.*	*Bbls.*	*Sklb. L. lb.*	*Sklb. L. lb.*	*Sklb. L. lb.*	
Reykjavík	1,606 3	1,809 2	66	2 8	495½	110	10	12	149 15	28½	327 14	58 14	9	19,567
Eskefjördhr			28		36	79½			151 10		92 12	56 4	4 3	26,186
Eyjafjördhr	30 18		36		17	561			278 6		166 17	11 5	24 11	79,900
Ísafjördhr	364 5	524 16	20	7 13	259	913	14		19 8		92 5	7 18		56,023
Total	2,001 6	2,333 18	150	10 1	807½	1,663½	24	12	598 19	28½	679 8	134 1	29 3	181,676
1624	843 0	5,817	444½		930				337 *	5½				
1630	207 0	2,823	142		1,445½				133½ *	5				
1743	392 0	5,380	658		471				475 6	3	265 0			
1779	3,612 0	4,901	1,905		1,402				609 8	16½	23 0			

	No. frocks or jackets.	Pairs of mit-tens.	Wadmal.	Lamb skins.	Salted sheep skins.	Small shark skins.	Fox skins.	Swan skins.	Goat skins.	Eider down.	Feathers.	Iceland moss.	No. reindeer horns.
			Pieces.							*Sklb. L. lb.*	*Sklb. L. lb.*	*Bbls.*	
Reykjavík	130	77,203	3	2,442	190	233	63	52		1 11	14 12	4	
Eskefjördhr	345	6,737	8	642	23,516		32			19			
Eyjafjördhr	5,790	57,798		3,723	9,091		15		115	19			153
Ísafjördhr	17	141,338		620	6	1,335	35	3		3 7½	12 1	¼	
Total	6,282	283,076	11	7,427	32,803	1,568	145	55	115	6 16½	26 13	4¼	153
			Ells.										
1624		12,232	12,251										
1630		13,004	4,042										
1743	1,211	110,507	876										
1779	884	186,624	521	20,722			406	98		6 0	2 9		

* Barrels.

No. 2.—*Table of imports into Iceland in the year* 1806, *copied from Sir G. S. Mackenzie's Travels in Iceland.*

Districts.	Rye meal.	Rye.	Barley.	Oats.	Peas.	Pearl barley.	Barley groats.	Buckwheat.	Oat groats.	Rice.	Wheat flour.	Rye bread.	Biscuit.	Wheat bread.	Danish brandy.	French brandy.	Grape brandy	Rum.	Wine.
	Bbls.	*Bbls.*	*Bbls.*	*Bbls.*	*Bbls.*	*Bbls.*	*Bbls.*	*Bbls.*	*Bbls.*	*Lispd. lb.*	*Lispd. lb.*	*Skpd. L. lb*	*Skpd. L. lb*	*Skpd. L. lb*	*Bbls.*	*Bbls.*	*Bbls.*	*Bbls.*	*Hhds.*
Reykjavik ...	3,502	2,265	27	72	777	531	128	7	8	3 10	66 0	90 15	226 4	47 4	255	43	149	28	60
Eskefjördhr ..	563	575	.....	4	310	145	109	.....	4	.....	.....	51 12	21 4	.....	59	98	6	4	8
Eyjafjördhr ..	978	2,965	32	6	856	190	80	5½	4½	1 0	28 5	35 14	19 17	13	105	52	25½	12½	6½
Isafjördhr	1,017	701	26	2	136	161½	56½	2	4	30 13	16 12	53 6	3 5	2 15	150	33½	32	3	12
Total	6,140	6,506	85	84	2,079	1,027½	373½	14½	20½	35 7	111 1	231 7	270 10	50 12	569	226½	212½	47½	86½
												Bbls.	*Bbls.*						*Pipes.*
In 1630	4,501	.....	.....	.....	17	83	.....	.....	.....	.....	.....	352	93	.....	262	.....	.....	.....	13½
In 1743	8,038	.....	.....	.....	52	135	.....	.....	.....	.....	.....	1,239	684	.....	722	14	12½	.....	57½
In 1779	10,665	475	1,138	98	133	367	.....	.....	.....	.....	.....	986	422	.....	1,160	36½	.....	18	71

Districts.	Vinegar.	Mead.	Beer.	Malt.	Coffee.	Sugar.	Treacle.	Tobacco.	Paper.	Soap.	Salt.	Iron.	Tar.	Coal.	Hackl'd hemp	Unhackled hemp.	Fish lines.	Cable.	Twine.
	Hhds.	*Bbls.*	*Bbls.*	*Bbls.*	*Skpd. L. lb*	*Skpd. L. lb*	*Skpd. L. lb*	*Skpd. L. lb*	*R'ms.*	*Firkins.*	*Bbls.*	*Skpd. L. lb*	*Bbls.*	*Lasts. bbls*	*Skpd. L. lb*	*Skpd. L. lb*	*Pieces.*	*P'ces.*	*Skpd. L. lb*
Reykjavik ...	5	24	7	10	13 15	24 17	13 14	96 19	63	46	842	170 13	159	26 4½	27 0	17 6	7,117	1,122	4 8
Eskefjördhr ..	1	9	.....	11	4 10	10 0	4 6	52 5	25	1	325	5 4	31	9	.....	.....	817	.....	3
Eyjafjördhr ..	2	17	34½	18	2 7	6 13	5 10	44 3	65	7	549	2 13	13	2 17	1 16	1 16	907	.....	1
Isafjördhr	2½	3	11	.....	6 6	7 5	1 13	44 13	4	1	862	21 14	116	3 0	3	3	3,630	23	2 0
Total	10½	53	52½	39	26 18	48 15	25 3	238 0	157	55	2,378	200 4	319	32 12½	27 4	19 5	12,471	1,145	6 12
										lbs.									
In 1693	.....	216	.....	38	.....	.....	.....	.....	.....	.....	834	781 0	61	.....	.....	.....	34,412	.....	9 1
In 1743	.....	67	.....	12	.....	.....	.....	20 10	.....	.....	1,864	272 0	147	.....	.....	.....	.....	.....	.....
In 1779	.....	67	.....	213	10 7½	27 0	.....	256 15	218	2,054	2,954	310 0	291	22 0	15 0	.....	12,890	.....	9 5½

NOTE.—1 Skippund = 20 Lisepund; 1 Lisepund = 17 English pounds.