

EXPEDITION TO THE ARCTIC SEAS.

FEBRUARY 22, 1877.—Recommended to the Committee on Naval Affairs and ordered to be printed.

Mr. WILLIS, from the Committee on Naval Affairs, submitted the following

REPORT:

[To accompany bill H. R. 4339.]

The Committee on Naval Affairs, to whom was referred the bill (H. R. 4339) to authorize and equip an expedition to the Arctic Seas, submit the following as their report:

That the object of the bill, “to authorize the President to fit out an expedition to the north pole, and to establish a temporary colony for purposes of exploration,” is so interesting and important in its character that they have, while not neglecting to gravely consider it with reference to its results both to science and commerce, availed themselves of all information accessible, and called in requisition the testimony and experience of men pre-eminent in scientific experience and learning, whose communications are hereto appended and made a part of this report.

The first inquiry pursued was whether, within the purview of the Constitution or otherwise, to fit out an exploration such as the bill proposes was an appropriate, legitimate function of the Government, for the exercise of which taxes could be properly levied upon the people; and, if so, whether the nation would get value received for the expenditure incurred and the perils to which its citizens would be exposed.

In reaching a determination, the fact has not been considered that there are numerous precedents in our history precisely covering the present case, to wit, the joint resolution authorizing the acceptance of Mr. Grinnell's vessels, approved May 2, 1850; the resolution respecting the Kane expedition, approved February 8, 1855; the Hall (Polart's) expedition, (see legislative, executive, and judicial bill, approved July 12, 1870;) the Wilkes exploring expedition, approved May 14, 1836, (see naval appropriation bill of that year.)

The action of the Government in the foregoing instances indicates the views of previous Congresses respecting such a measure, as all such expeditions have been conducted under the auspices of the National Government. Nor has any importance been attached to the action of other governments, who not only heretofore have inaugurated such enterprises, but are contemplating the inauguration of others on a magnificent scale.

We have ascertained, to our satisfaction, that the results yielded by prior explorations in the Polar Seas have incalculably benefited the whole world; that the knowledge acquired by experiment and discovery in

that region can be obtained in no other way and in no other section of the globe; that such knowledge is an important factor in the regulation of commerce, which is absolutely dependent, so far as decreasing the perils of the deep and enlarging the boundaries of navigation are concerned, upon the knowledge of physical laws.

The Constitution gives Congress power, in section 8 of article 1—

To regulate commerce with foreign nations.

And also in the same section and article—

To make all laws which shall be necessary and proper for carrying into execution the foregoing powers.

So the question as to the power of the Government is without the domain of doubt or discussion.

The Government has the constitutional power. Is it proper to exercise it?

Whatever benefits are harvested favor no special interest or class. The added knowledge obtained is the property of mankind.

Give a subsidy, you enrich a corporation by extorting from the body-politic. Impose a duty for the purpose of protecting a particular industry, you enrich a few while you impoverish the many. Explore the remote corners of the earth, you awaken inquiry, add to the stock of information, and contribute essentially to man's mastery over the elements.

None among those who believe that money is well expended to increase knowledge, to improve the chances of life, to enlarge the commerce of our nation, and who appreciate the notable results already achieved in this special field of adventure and study, will belittle or sneer at the enterprise proposed in this bill. Some declare, by way of depreciation, that failure and disaster have been the reward of the dauntless explorer. In a certain measure, true. But the ends aimed at are worthy of sacrifice. Hall and Franklin died just as gloriously, just as serviceably, just as heroically, as Warren at Bunker Hill or Sedgwick at the Wilderness.

Valuable experience and information have been obtained within past years which are now at the service of any new explorer, and new plans based on such experience and information have been examined by your honorable committee, which point out the causes that have hitherto contributed to disaster and partial failure.

This plan is known as "Polar colonization," and has received hearty indorsement from such distinguished experts, scientists, students, and explorers as Professor Joseph Henry, president of the National Academy of Sciences; Professor Loomis, of Yale College; President Potter, of Union College; Admiral Porter; Rear-Admiral Davis, superintendent of the National Observatory; Hon. Charles P. Daly, president of the American Geographical Society; Dr. Isaac I. Hayes, the explorer, and others, while it is heartily approved also by the honorable Secretary of the Navy; and your committee are inclined to commend it to the favor of Congress, more especially if its execution be intrusted, as the bill provides, to the President, under the direction of the National Academy of Science.

The entrance to Robeson's Channel, 81° N., can be readily reached by steam-vessels. Surveys by the *Polaris* in 1871, and the *Alert* and *Discovery* in 1875, have been made to a point within four hundred miles of the pole.

As the *Polaris* was reaching the northern extremity of Robeson's Channel, there appeared what was seemingly, and what those best qualified to judge believed to be, an open polar sea. This sea could have been reached had the vessel arrived at such point even an hour

before, and the dream of explorers would have been a reality; but the adventurous party were forced back, and wintered but a short distance from the unexplored waters.

Captain Nares, in 1875-76, encountered above this channel an unbroken field of ice, too solid to penetrate with vessels, too uneven to be traversed by sledge parties.

So, it will be observed, seasons there are no less variable than our own. Sometimes the mighty fields of ice are broken up and carried away by favoring tides; sometimes the ice presents an impassable barrier.

To succeed under such plans as have formerly been followed would be simply because chance supported them. To make success assured, the men and the vessels must be nigh the channel, ready for the fortunate hour, and prepared to take prompt advantage. To obviate the difficulty and meet the exigency, polar colonization is declared the appropriate mode, and is therefore urged by the distinguished gentlemen we have named.

This plan requires that the colonization party should number at least fifty hardy, resolute men, enlisted in the United States for such service, provided with supplies and provisions for at least three years; that a strong substantial building should be carried on ship-board; that the principal depot should be in Lady Franklin Bay, between 81° and 82°, or, if possible, as high as Cape Union, between latitude 82° and 83°; the United States vessels to be used only for transporting men and supplies to the location of the colony, the vessel then to return to the United States, and afterward to make annual visits with fresh supplies, and to keep the colony in communication with the outer world; military discipline to be enforced; three commissioned officers and two surgeons to be selected, with a view to their peculiar fitness; an astronomer and two or more naturalists to be selected by the National Academy of Sciences; and that one or more members of the regular force should be competent to make meteorological observations, and to communicate by telegraph and signals, when necessary.

Such are the main features of the plan, which also provides that all due precaution shall be had to afford safeguards against scurvy, against the ill effects of cold, and also to protect the colony from hunger.

In the vicinity of the point where the colony is to locate, coal abounds, game is plentiful, Esquimaux men can be had to re-enforce and guide the expeditionary corps, and Esquimaux dogs to draw the sledges. The men become acclimated after a few years, and Captain Hall, who was eight years among the Esquimaux, testifies that each year ended found him better fitted to endure the severity of the Arctic Circle.

Other nations are at this moment hurrying forward exploring expeditions to be prosecuted under this plan.

Noble men in our own country are eager to enlist in the enterprise.

Intelligent and liberal capitalists are ready to give of their means to forward it.

There has never before been an opportunity afforded, so promising in results as the one which now presents itself.

To make such explorations entirely successful, it is essential that simultaneous observations be had at different points within the Arctic Circle, and for continuous periods of time.

England, during the present year, will fit out two vessels under the explorer Nares, on a polar expedition via the east coast of Greenland.

Sweden, in 1878, under the auspices of Professor Nordenskjöld, will

explore the polar regions via Norway across to by way of Behring's Strait.

Holland has determined upon another.

Germany, under the direction of the Arctic Exploration Society, has an Obi expedition, commanded by Captain Wiggins, now on duty.

Russia, during the coming spring, will push forward an ethnological expedition, under the Helsingfors professor, to the Vogels and Ostyaacs of the Obi and Irtysh.

And eminent explorers as well as scientific societies of all civilized countries are busying themselves in an endeavor to establish stations at different points in the Arctic regions with a view of systematic synchronous observations, which are absolutely essential, with a view to progress in scientific discoveries.

There is scarcely a natural science but would be enlarged and utilized by proper observations in the polar seas. Natural forces there are subject to extreme conditions, and, consequently, produce phenomena not seen elsewhere, and which serve to unveil the character of the forces themselves.

Terrestrial magnetism, hitherto deemed a science of comparative unimportance, is now deemed the most consequential branch of physics; it is controlled by cosmical, atmospherical, and terrestrial action, and in the economy of nature exercises a reciprocal control.

Reliable observations show the existence of galvanic currents and the relationship between magnetic disturbances and northern lights and earthquakes, while it is well known that magnetism is in inseparable connection with galvanism and electricity. In the extreme north, the needle is rarely stationary. There, too, the wrathful storms rage as nowhere else. Such are the reasons why, if this intensely interesting science is to grow, observations must be had in that remote archipelago of ice.

Scarcely less interesting, and no less important to the world, than terrestrial magnetism is a knowledge of the atmosphere and its phenomena, especially their relation to heat and moisture, which is comprehended in meteorology. In the far north, and there only, can be ascertained the effect of that immense aggregation of ice; how heat is engendered and distributed; how dry and humid currents are created and put in motion to commingle and combat each other; to what extent climate is affected in this wise; and how hurricanes, which visit mankind with wrathful destruction, originate. Is it necessary to exhibit, by any process of reasoning, the utility of such knowledge, the advantages which would accumulate to science and to commerce?

The flattening of the earth at the pole, and the extraordinary refractions there, would yield such opportunities for investigation as would enable us to measure the earth with greater accuracy, to correct lines of latitude and longitude, and also greatly facilitate the study of astronomy.

Natural history and botany would be vastly enriched, as is attested by the existence of rare flora and fauna.

Geology has found there the groundwork of new theories and the explanation of many old ones. In Siberia are found animals of anterior worlds, while in Nova Zembla, Spitzbergen, and Greenland are fossils so abundant and rare that the paleontologist exults in his enlarged sphere.

Wonderful already are the discoveries made in each field of inquiry noted; but we are yet in the vestibule. The region of the unknowable

is just beyond; we are invited thither. We know enough to realize the wealth which awaits us.

Hitherto observations have been limited and imperfect, the most important of them wholly neglected; accurate data as to all of the sciences named are wanting.

Geographic discovery has hitherto been the objective point. While this is praiseworthy, while it adds a most important chapter to the book of knowledge, it should not be the primary object to which all others are subordinated.

An absolute change of operations must be had. This change will be effected by the passage of the bill H. R. 4339. It meets the exact need. It provides for a long stay, which will give ample opportunity for observations and the conduct of scientific inquiry under the most favoring conditions. It provides that an intelligent system shall be pursued, under the direction of the National Academy of Sciences.

Ordinarily, the expeditions have been so conducted as to actually preclude scientific discovery—all appliances left at home, and almost continuous locomotion.

Other nations are adopting the same methods, and while American scientists are taking observations in the vicinity of Robeson's Strait, like observations will be taken in Behring's Strait, on the east coast of Greenland, in the vicinity of Spitzbergen, and at other points, simultaneously covering the whole field—belting the whole arctic world—for several consecutive years.

Other nations are already there or getting in readiness to be there. The way through Smith's Sound, where De Haven, Kane, Hall, and Hayes, by their heroic researches, have given immortal glory to America, seems to be the fittest field for Americans in this race for conquest and discovery. It is familiar, and other fields are already chosen by other governments.

Dismiss the unsettled, vexed question, which is the most direct and practicable route to the pole? Conditions vary. One year one is preferable, another, another; all are equally rich in scientific treasures, and will yield to searchers after knowledge an equal harvest, though the weight of testimony, even for geographical discovery, is in favor of the American route, as the exhibits appended indicate.

The plan which this bill contemplates happily blends geographical and scientific discovery; it will facilitate both, and result in both.

The importance of the fitting-out of this expedition at this particular time, with a view of co-operation with others, should not be out of mind, for meteorology depends upon comparison resulting from simultaneous observations. The laws of storms and the theories of winds depend upon such comparison. In no other mode can conclusive results be attained.

If we make any pretense as friends of science, we must pursue the only methods whereby development can be achieved. Those methods have been pointed out. But supposing we should disregard the impulse of honor and glory; supposing we were controlled alone by the instinct of a supreme selfishness, which considers nothing but the questions, will it pay? will it help commerce? will it economize human life and property? there would still be sufficient reasons left to justify this undertaking.

We can support this statement sufficiently by accepting the testimony of Prof. Elias Loomis, of Yale College, who says, in his admirable letter, hereto appended:

The vast extension of the commerce of the world in recent times, and its increased security, are due in no small degree to more accurate information respecting the physics

of the globe, including such subjects as the mean direction and force of the prevalent winds; the laws of storms; the use of the barometer in giving warning of approaching violent winds; the surest mode of escaping the violence of a storm when overtaken by a gale; the most advantageous route from one part to another; the direction and velocity of the current in every ocean; the variation of the magnetic needle in all latitudes, and its changes from year to year; together with many other problems; and most of these investigations have been greatly facilitated by observations which have been made within the arctic regions. I do not regard it as any exaggeration to claim that the benefits which have resulted, both directly and indirectly, to the commerce of the world in consequence of polar expeditions, are more than equal to all the money which has been expended on these enterprises.

Last year a whaling-fleet of twelve vessels was wrecked in the Arctic Sea, and property to the amount of half a million of dollars destroyed, all because of a lack of proper knowledge of climatic and tidal influences, which can alone be obtained by observations made in the manner provided for in this bill.

Business-men have a keen appreciation of the importance of these explorations to commerce. They have always been anxious to aid them by liberal contributions. Some of them have been prosecuted solely by private means. The names of many merchants have been given to capes and bays and promontories and straits, as vouchers of the fame they have so justly earned by intelligent devotion to science.

Boards of trade and chambers of commerce are now, through memorials, already before this committee, invoking us to pass this bill, and renew the honorable work.

The cost is slight. The ends aimed at will provoke no intelligent opposition. The methods proposed are not experimental, but the product of experience. They have the sanction and even the warmest commendation of all scientific men of all nations. The supervision of the National Academy of Sciences will insure wise provisions and safeguards against accident, disease, or failure. Dr. Hayes, the eminent and successful arctic explorer, coincides fully with the views herein expressed, as also do others familiar by actual experience. Their letters are so instructive that we make them a part of this report.

The honor of the American name is involved. Will Congress suppress this zealous spirit of inquiry and adventure, or give it scope by the passage of this bill, and a meager appropriation of fifty thousand dollars? To us it appears there should be but one answer, and, therefore, we report back the bill with a recommendation that it do pass.

EXHIBIT A.

Letter of the Secretary of the Navy.

NAVY DEPARTMENT,
Washington, February 2, 1877.

SIR: In connection with House bill No. 4339, now in your hands, and which provides for another arctic expedition, I have to express a hearty interest therein and an earnest hope for the success of the plan. The successful sledge-journey made by Captain Hall before his death, the concurrent testimony as to a polar sea open in some seasons, and all the details of evidence from the *Polaris* crew, seem to show that success is possible. Qualified officers, I doubt not, will gladly volunteer for such duties as may be assigned the Navy in connection with such an expedition. I am convinced, however, that no expedition should be sent to this dangerous and distant region except under the sanction of the strictest military discipline.

I have the honor to be, &c.,

GEO. M. ROBESON,
Secretary of the Navy.

Hon. BENJAMIN A. WILLIS,
Of the Committee on Naval Affairs, House of Representatives.

EXHIBIT B.

Letter of President Joseph Henry, LL. D.

SMITHSONIAN INSTITUTION,
Washington, January 31, 1877.

SIR: Your letter of the 30th instant, asking my opinion as to the plan of Captain Howgate for explorations in the arctic regions, and its utility in regard to scientific and commercial results, has been received, and I have the honor to give you the following reply:

From my connection with the Smithsonian Institution and the National Academy of Sciences, I am of course interested in every proposition which has for its object the extension of scientific knowledge, and therefore I am predisposed to advocate any rational plan for exploration and continued observations within the arctic circle.

Much labor has been expended on this subject, especially with a view to reach the pole; yet many problems connected with physical geography and science in general remain unsolved.

1. With regard to a better determination of the figure of the earth, pendulum-experiments are required in the region in question.

2. The magnetism of the earth requires for its better elucidation a larger number and more continued observations than have yet been made.

3. To complete our knowledge of the tides of the ocean, a series of observations should be made at least for an entire year.

4. For completing our knowledge of the winds of the globe, the results of a larger series of observations than those we now possess are necessary, and also additional observations on temperature.

5. The whole field of natural history could be enriched by collections in the line of botany, mineralogy, geology, &c., and facts of interest obtained with regard to the influence of extreme cold on animal and vegetable life.

All of the above-mentioned branches of science are indirectly connected with the well-being of man, and tend not only to enlarge his sphere of mental pleasures, but to promote the application of science to the arts of life.

As to the special plan of Captain Howgate, that of establishing a colony of explorers and observers, to be continued for several years, I think favorably.

The observations which have previously been made in the arctic regions have usually been of a fragmentary character, and not sufficient in any one case to establish the changes of the observed phenomena during an entire year, whereas to obtain even an approximation to the general law of changes a number of years are required.

It may be proper to state, in behalf of the National Academy of Sciences, that should Congress make the necessary appropriation for this enterprise, the academy will cheerfully give a series of directions as to the details of the investigations to be made, and the best methods to be employed.

I have the honor to be, very respectfully, your obedient servant,

JOSEPH HENRY,

Secretary Smithsonian Institution, President National Academy of Sciences.

Hon. BENJ. A. WILLIS,
House of Representatives.

EXHIBIT C.

Letter of Admiral David D. Porter.

WASHINGTON, D. C., January 31, 1877.

SIR: I beg leave to acknowledge the receipt of your note of January 30, with accompanying pamphlet, in relation to polar colonization and exploration.

I have examined the pamphlet with the care that the importance of the subject demands.

I have always been an advocate for arctic exploration, in whatever form it might be undertaken, and I think there would be no greater difficulty in carrying out an enterprise in the manner you propose than there would be in a ship. In fact, if an expedition was properly fitted out in the first instance, and landed in good condition at the point proposed as headquarters, it would be less hampered if the ship should return home until wanted with supplies.

In my opinion, there is an open sea for two hundred miles toward the pole; that there are high mountains, from which are precipitated the icebergs which lately blocked up Robeson's Channel; and that had Markham's farthest point been exceeded by sixty miles, the pack would have been passed and open water reached a gain.

Every few years we must expect just such a pack as Captain Nares encountered, which will probably last for a year or two, and will then break up.

If, at the moment of breaking up, men and boats are in readiness to take advantage of the opportunity, a great advance could be made toward the pole.

There are no greater hardships to be encountered as high as 83° than have heretofore been surmounted by the intrepid explorers of the arctic regions, and when we reflect that a party from the *Polaris* drifted eighteen hundred miles on a cake of ice, and that an infant and its mother were all that time exposed to the inclemencies of the arctic regions, we ought to have no doubts about a company of strong, active men, well provided with everything necessary to make life endurable in that desolate region.

Certainly no weather can be more severe than that encountered by the officers and men of the *Alert* and *Discovery*, who experienced a temperature of 100° below the freezing-point. It would seem that there are actually no drawbacks in the way of weather which have not been encountered before, and we are able to make every preparation to meet the difficulties in our way.

It becomes now simply a question of hardy men with brave hearts and cheerful dispositions, provided with an ample stock of the best provisions, and with means of amusement to make the winter night pass as speedily as possible. The greatest difficulty will be to keep up the spirits of the men, and this matter should be very seriously considered in selecting the individuals for an expedition of this kind. Nostalgia is the great enemy you would have to fear; and if every man should be obliged to understand some mechanical pursuit which he could follow when the party was laid up for the winter, it would go far toward bringing about a successful issue.

In the event of such an expedition as you propose, I see a fine opportunity of utilizing the electric telegraph. Wires could be laid along on the ground or ice without much danger of their being carried off by bears or foxes.

I am no believer in a northwest passage for any practical purpose, but I do believe that there are a number of scientific subjects that can be better demonstrated at the north pole than anywhere else, and I think we owe it to ourselves to know all about a matter which has hitherto remained in comparative obscurity.

In establishing your colony I would particularly suggest that a number of houses be erected and somewhat separated. That of itself would tend to create a diversion by causing the men to visit each other frequently. It would be well, however, to have one central depot under the eye of the commanding officer, where the command could be assembled as occasion might require. These houses could be made in sections and put up at the end of the voyage. They should be lined with thick felt, and would be very comfortable.

In connection with the proposed expedition, I recommend a combination of sledge and boat, somewhat after the plan of the gutta-percha or kerite-rubber life-rafts used in the Navy. They could be made very light for carrying packs, and when forced to take the water could be navigated with safety. If such appliances had been more used in arctic explorations many lives might have been saved.

In conclusion, permit me to say that I can see no objection whatever to your plan, and hope you may meet with the success your energy deserves.

Very respectfully, yours,

DAVID D. PORTER, *Admiral*.

Capt. H. W. HOWGATE, U. S. A.,
Signal-Office, Washington, D. C.

EXHIBIT D.

Letter of Rear-Admiral Charles H. Davis.

NAVAL OBSERVATORY,
Washington, D. C., January 31, 1877.

SIR: I have the honor to acknowledge the receipt of your communication of the 30th instant, and to say, in reply, that the plan for arctic exploration proposed by Captain Howgate, United States Signal Corps, meets my entire concurrence and approval.

The general principles laid down by Captain Howgate for the conduct of future arctic expeditions seem to be universally adopted. These principles originated in the recent expedition under Captain Hall.

Very respectfully, your obedient servant,

C. H. DAVIS,
Rear-Admiral, Superintendent.

Hon. BENJ. A. WILLIS,
Chairman Subcommittee on Naval Affairs, House of Representatives.

EXHIBIT E.

Letter of Dr. Isaac I. Hayes, Arctic Explorer.

STATE OF NEW YORK, ASSEMBLY CHAMBER,
Albany, February 12, 1877.

MY DEAR SIR: I am glad to see you are getting on so well with your proposed expedition, and that the matter is in such good hands. You can, of course, always rely upon me for any assistance in my power. I think your scheme feasible, and trust sincerely that you will obtain the necessary appropriation. Your general plan is a good one, and how fully I am in accord with it you may judge from a paper read by me before the Geographical Society in New York, November 12, 1868, from which I extract the following:

"My views in this respect are in no way changed, but rather they are confirmed by events. I give this simple enumeration of its advantages: 1st. Land as a base of operation; 2d. The opportunity to colonize a party of hunters and natives, as a permanent support. A glance at the map will show you how important is the first of these elements; the second requires a further explanation. The colony was indeed the key to the plan which I had proposed for 1862. Had I been able to return that year, I would have started with two vessels, one a small steamer, the other a sailing-vessel as a store-ship. Pushing through the middle ice of Baffin Bay I would have steered for Port Foulke, my old winter-harbor, at the mouth of Smith Sound. Here I would have secured the auxiliary vessel, and, remaining only a sufficient length of time to see the natives gathered together and the wheels of my little colony set in motion, I would have sought the west coast of Smith Sound with the steamer, and through the land-leads have worked my way to the polar water. Failing to accomplish this the first season, I would have secured a harbor for the winter, and pushed on the work as opportunity offered. Failing altogether, (in the event of finding the ice too closely impacted at the head of Smith Sound to admit of a passage,) I would still have secured my object, for, with a provision depot now within six hundred miles of the pole, with the colony at my back, and in the winter readily accessible, with dogs breeding there, and with furs and provisions accumulating, I would have overcome the obstacles which embarrassed me in 1860 and 1861, and which had embarrassed Dr. Kane before me. Once in this favorable situation I would have brought up my available strength from the colony, and, in the early spring, put out depots of provisions along the line of Grinnell Land, and following them up with a boat mounted on runners, I would then have sought the open water and the pole. Such was my plan seven years ago. It is my plan to-day. I believe it reasonable, and experience convinces me that it is practicable. I even believe that the chances are greatly in favor of the success of the first part of the scheme; that is to say, that the ice belt can be penetrated with the steamer, the open sea navigated, and Behring Strait and the Pacific Ocean reached."

If you care to follow up the subject so far as my views are concerned, you will find them fully expressed in the Journal of the Geographical Society for 1869, vol. 2, part 2. I think it will be evident to you that the great feature of my plan was that the colony at Port Foulke would be always accessible from home every summer, with as much certainty as any port in the world. Besides, it is one of the most prolific centers of animal life in all that region. Reindeer are numerous in its vicinity; my party capturing upward of two hundred during our ten months' stay in our winter-quarters. During the summer, the air was teeming with bird-life, and the sea was alive with walrus and seal. Bears and foxes were also numerous. Your extensive reading upon the subject of arctic exploration will have shown you that men will not long endure the arctic climate. Even Sir Edward Parry, the greatest of all arctic navigators, found himself obliged to return home after two winters, mainly because of the disturbed *morale* of his men. The long-continued darkness of the winter, the entire deprivation of society, and the universal cheerlessness have a singularly depressing influence upon the mind, and you will therefore at once perceive the value of establishing a station where annual intercourse can be had with home, whence the sick and weary can be sent away, and new recruits brought into the field.

With Port Foulke as a principal station, and other points subordinate to it established on the coast of Grinnell Land, up to Lady Franklin Bay and beyond, I think success would be assured in the course of three or four years. In any case, a vast amount of scientific information would be obtained at little cost and little risk to life.

Wishing you every success in your praiseworthy endeavor, believe me, very truly,
yours,

I. I. HAYES.

Capt. H. W. HOWGATE,
Washington, D. C.

EXHIBIT F.

POLAR COLONIZATION.

THE ARGUMENTS BROUGHT BY PROFESSOR LOOMIS TO THE SUPPORT OF CAPTAIN HOWGATE'S SCHEME.

The following letter has been written by Professor Loomis, of Yale College, the distinguished meteorologist, to Captain Howgate, in support of the latter's scheme of arctic colonization. It will be found of interest as illustrating the scientific benefits to be derived from a polar expedition based upon this plan :

"I have received your letter of January 7, together with a copy of a bill to be presented to Congress asking for an appropriation to defray the expense of another expedition toward the north pole. I have for many years taken a deep interest in polar expeditions, and see no reason for abandoning further effort because former expeditions have not accomplished all that was expected. If we review the entire history of polar expeditions since Captain Parry's first voyage, more than half a century ago, we find that every expedition has proved in some sense a failure; that is, has accomplished less than was anticipated; and some may therefore conclude that all the labor which has been expended on this polar problem has been wasted. I take a very different view of the subject, and consider that the results of the many polar expeditions, from the first voyage of Captain Parry to the present time, are worth far more than all the money and labor which have been expended on them. In order to estimate the value of the results of these expeditions, we should consider what would have been the state of our knowledge of the physics of the globe if no such expeditions had been undertaken. There is scarcely a problem relating to the physics of the globe which can be fully understood without a knowledge of the phenomena within the polar regions. Whatever phenomenon we may wish to investigate, it is of special importance to determine its maximum and minimum values, and in nearly all questions of terrestrial physics one or other of these values is found in the neighborhood of the pole. If, for example, we wish to determine the distribution of temperature upon the surface of the globe, it is specially important to determine the extremes of temperature, one of which is to be found near the equator and the other near the poles. If we wish to investigate the system of circulation of the winds, our investigation would be sadly deficient without a knowledge of the phenomena in the polar regions. If we wish to study the fluctuations in the pressure of the atmosphere, whether periodical or accidental, we cannot be sure that we understand the phenomena in the middle latitudes unless we know what takes place in the polar regions. If we wish to investigate the currents of the ocean, we find indications of currents coming from the polar regions, and it is important to be able to trace these currents to their source. If we wish to investigate the laws of the tides, we need observations from every ocean; and observations in the arctic regions have a special value, on account of their distance from the place where the daily tidal wave takes its origin. If we wish to study the phenomena of atmospheric electricity and of auroral exhibitions, no part of the world is more important than the polar regions. If we wish to study the phenomena of terrestrial magnetism, observations in the polar regions have a special value, since it is here the dipping needle assumes a vertical position and the intensity of the earth's magnetism is the greatest. If we wish to determine the dimensions and figures of the earth, we require to know the length of a degree of latitude where it is greatest and also where it is least. If we wish to determine how the force of gravity varies in different parts of the world we require observations of the length of the second's pendulum both where it is greatest and where it is least.

"In short, there is no problem connected with the physics of the globe which does not demand observations from the polar regions, and generally the poles and the equator are more important as stations of observation than any other portions of the earth's surface. If the information which has been acquired upon the various subjects in the numerous polar expeditions of the last half century were annihilated, it would leave an immense chasm, which would greatly impair the value of the researches which have been made in other parts of the world. The subjects to which I have here referred are scientific rather than commercial; but many of them have an important bearing upon questions which affect the commerce of the globe. In the attempts which are now being made by the joint efforts of the principal nations of the globe to determine the laws of the storms, if we could have daily observations from a group of stations within the arctic circle, it is believed that they would prove of the highest value in enabling us to explain the phenomena of the middle latitudes. Every winter upon the eastern side of the Rocky Mountains we find an intensely cold wave moving down from the northward and spreading over a large portion of the United States. How can we fully understand the cause of the great changes of temperature which so frequently occur during the winter months unless we know where this cold air comes from; and how can this be determined without fixed stations of observation extend-

ing northward even to the polar regions? The vast extension of the commerce of the world in recent times and its increased security are due in no small degree to more accurate information respecting the physics of the globe, including such subjects as the mean direction and force of the prevalent winds, the laws of storms, the use of the barometer in giving warning of approaching violent winds, the surest mode of escaping the violence of a storm, when overtaken by a gale, the most advantageous route from one part to another, the direction and velocity of the currents in every ocean, the variation of the magnetic needle in all latitudes and its change from year to year, together with many other problems; and most of these investigations have been greatly facilitated by observations which have been made within the arctic regions. I do not regard it as any exaggeration to claim that the benefits which have resulted both directly and indirectly to the commerce of the world in consequence of polar expeditions are more than equal to all the money which has been expended on these enterprises. Is any additional advantage to the commerce of the world to be anticipated from further explorations in the polar regions? Undoubtedly. Precisely what these advantages may prove to be we cannot certainly pronounce beforehand, but upon most of the questions to which I have already alluded more minute information is needed. The demands of science are by no means satisfied, and we may confidently anticipate that any advance in our scientific knowledge respecting questions connected with the physics of the globe will impart increased security to commerce. If a steamer starting from New York and traveling northward could pass directly over the north pole through Behring Strait into the Pacific Ocean, it would be a triumph of geographical science equal to the first discovery of America. Whether such a result will ever be witnessed we cannot safely predict, but past explorations have not shown that such an achievement is impossible. I hope we shall not rest contented while so much that is clearly feasible remains to be done, and until the northern boundary of Greenland has been traced."

EXHIBIT G.

Letter of Capt. George E. Tyson, of the Polaris.

WASHINGTON, D. C.

DEAR SIR: I was very agreeably surprised to see your letter, published some time ago in the New York papers, containing a proposition to Congress to appropriate money, ship, and the necessary equipment for another expedition to endeavor to reach the north pole, and I heartily concur with you in the plan therein suggested as the most practicable yet devised. It is a matter of no little surprise to me that there has not been more of an outpouring of American enthusiasm toward the achievement of the success of this great enterprise, and that, too, when we consider the magnitude and great importance of the work. It is unquestionably a noble effort, and the scientific societies of the country would do well to unite in memorializing Congress relative thereto. Now is the time, and if this Government fails this year, through a spirit of parsimonious economy, to appropriate the means necessary to the furtherance of this project, England or Germany will, in all probability, secure the honor of this great achievement.

GEORGE E. TYSON.

Capt. H. W. HOWGATE.

EXHIBIT H.

Letter of Capt. H. C. Chester of the Polaris Expedition.

To the Editor of the New York Times:

Having had some experience in arctic exploration, and being familiar with its dangers and difficulties, my attention has been called to the letter of Capt. Henry W. Howgate, published in the Times on the 26th of December. I beg to express my thorough approval of the plan submitted by Captain Howgate, as I believe it to be the only way by means of which the pole can be reached. All future explorations tending to solve the mysteries of this extreme northern region will have to be prosecuted by means of gradual advances made from some main depot. Exactly the same idea was entertained by Captain Hall. When we were at the furthest point of land, about 82° 8', in October, 1871, we looked at the so-called impenetrable sea of ice. Then it was moving ice and water. From its smoothness we felt very sure that when the colder weather set in we would have but little trouble traversing the channel in the spring. We should have endeavored to have crossed Robeson's Straits, and would have tried to

gain a point of land visible northwest of us, which land we called Cape Union, and which we calculated was some sixty miles distant. If Captain Howgate's suggestions of establishing a party at or about Robeson's Channel, or to the west of it, is ever carried out, I think these people would by progressive stages reach in time the much desired goal. As to the obstructions mentioned by Captain Nares, all I can state is that such impediments did not exist in my time. The reasons why I suppose they cannot be so formidable are founded in the following observations: When in May and June of 1872 we lay with the boats and crew of the *Polaris*, twenty-five miles from the ship, on the floe-ice, waiting for an opening in Robeson's Channel, in order to cross it, during four weeks' time the straits were blocked with ice, but this ice was all moving south. We found no opening for a month, and were unable to use our boats. This ice went southerly at the uniform rate of about one and a half miles an hour, and was never checked, save when the winds blew south or southwest. If, then, the strait was filled with ice moving southerly, such an impassable barrier of ice as Captain Nares speaks of must have been found at a point very much farther north than the land designated by us as being Cape Union. I do not think there could have been much of an error as to the distance we supposed ourselves to be from this Cape Union, and the north pole could not have been more than four hundred and twenty miles north of it.

When Captain Hall and the writer undertook the fourteen-day sledge-journey, when we worked our way along in the twilight, Captain Hall said to me, "I am satisfied that the only way to reach the pole will be for us to carry our provisions across Robeson's Channel, to form a depot on the other side, and from thence take out parties. It is work we must lay out for ourselves this spring." I believe had Captain Hall lived he would have carried forward the work just as Captain Howgate proposes: that is, by establishing depots and making progressive stages. Captain Hall's untimely death, on the 8th of November, 1871, prevented his accomplishing this design. I think, in order to prosecute the plan proposed by Captain Howgate, there would be no difficulty in procuring thirty men, accustomed to Arctic travel, who would ultimately achieve success. As to fresh-blood food, I am positive that, at least in the neighborhood of Robeson's Channel, the musk-ox can be found from May to October. I shot the first musk-ox on the *Polaris* Plain in $81^{\circ} 40'$ during the latter part of September. With the crew of the *Polaris* in the latitude of 82° , we killed twenty-four musk-oxen. I do not believe there would be any trouble in provisioning thirty men yearly with this fresh food. I therefore most freely indorse Captain Howgate's views, and say with him, "Let an expedition be organized to start in the spring of 1877, and I firmly believe that in 1880 the geography of the polar circle would be definitely settled, and that without loss of life."⁹

H. C. CHESTER.

PHILADELPHIA, Saturday, December 30, 1876.

EXHIBIT I.

Letter of Mr. Robert Seyboth, a member of Dr. Hayes's Expedition.

* * * * *

I have not the slightest doubt, if a sufficient number of energetic men, well selected and officered, can acclimate themselves to the terrible severity of arctic winters, the greatest difficulty in the way of the discovery of the pole will have been overcome, for such a party and depot could be used as a base of operation from which to push forward, in favorable junctures of temperature and their accompanying condition, successive posts, each one to be permanently held until the next was established, and until some favoring season made the open polar sea a navigable reality.

The great question to be answered in considering your scheme is the possibility of sustaining human life at such high latitudes for a sufficient length of time. I do not hesitate to answer this question in the affirmative. My own experience during a stay of nearly two years within the arctic circle, and with an expedition that possessed none of the comforts and safeguards usually provided for arctic explorers, warrant me to believe that a systematically-conducted plan of colonization, such as you propose, would meet no insurmountable difficulties in the effort to sustain life and sufficient robustness to carry out the work of exploration. Scurvy, the great enemy of former explorers, can be entirely avoided by adopting the proper hygienic precautions, as has been fully proved by the late Captain Hall, who spent several years in succession in company of the Esquimaux, in perfect health and without assistance from the outside world.

It is a noteworthy fact that American whalers, who frequently remain two or more successive winters in the arctic regions, do not suffer from scurvy while wintering, but are almost invariably afflicted with the fell disease during the homeward voyage. Why? Because they do not hesitate to eat plentifully of seal, walrus, bear, and even whale meat, all of which is readily obtainable in the highest latitudes. To this diet

I myself found no difficulty in becoming accustomed, and, consequently, did not suffer from scurvy until after the enforced resumption of "salt junk" on the homeward stretch. Granting, then, the possibility of colonization, I fully believe that the adoption of your scheme would strike at the root of former failures in arctic explorations, for it substitutes the steady conquest, step by step, in place of the spasmodic and unstained efforts hitherto made at the sacrifice of untold treasure and the loss of great and noble lives.

Very respectfully,

Capt. H. W. HOWGATE.

ROBERT SEYBOTH.

EXHIBIT K.

Letter from Hon. Charles P. Daly, LL. D., President of the American Geographical Society.

AMERICAN GEOGRAPHICAL SOCIETY,
NO. 11 WEST TWENTY-NINTH STREET, NEW YORK CITY,
January 18, 1877.

MY DEAR SIR: Before your letter was received I inserted in my annual address a notice of your plan and of the bill before Congress.

As you will find by my address, your mode of exploration is the one that I have uniformly approved and recommended for many years. I expressed this opinion in my address of 1869, and in the first of my addresses, which have been printed. (1870.) I declared my conviction that a passage to the pole by water would, in all probability, not be found, and that the true method of exploration was by sledge operations upon land from the farthest point that could be safely reached by a vessel.

You will see from this that I have long been impressed with your general plan, and the only criticism I have to offer is that I think the station should not be limited to some point north of 81°; for though a vessel may winter securely in Discovery Bay, and although there is a fine seam of bituminous coal three miles from where the Discovery wintered, yet the region, as shown by the experience of the English expedition and by the abandonment of the Esquimaux settlements just below it, is very barren of animal life either upon the land or upon the water, whilst at Port Foulke it is otherwise, and a temporary colony could be maintained there without any difficulty. For this reason I think it would have been better to have said north of 78°.

It will afford me great pleasure to do all that I can to forward your views, and anything that the society can do I am sure will be done.

The suggestion I have made as to the limitation in the bill as to location of colony is entirely for your consideration, and will in no way affect our hearty support of the measure.

Very truly, yours,

CHAS. P. DALY.

Capt. H. W. HOWGATE.

EXHIBIT L.

Letter from Rev. Eliphalet Nott Potter, D. D., President of Union College.

UNION COLLEGE, SCHENECTADY, N. Y.,
February 15, 1877.

MY DEAR MR. WILLIS: * * * I have not noticed whether the bill for Arctic exploration has yet been reported; if not, as I understand it to be in your hands, permit me to say, for myself and the faculty, that we regard the measure with great solicitude, and hope much from its becoming a law. In the naturally-intense interest which you feel in the presidential national question, don't fail to remember and to press this measure of importance to science and the welfare of the world.

It will be a proud thing for the practical genius of America to carry out the only feasible approach to the solution of a question, costing only a useless outlay of life and treasure so long as the end is pursued by the old method.

In haste, and sincerely, yours,

E. N. POTTER.