

experienced in the past two years worse than anything that has been known in sixty years; but probably the Philippines has experienced its worst luck in the two years' visitation of locusts, which have destroyed everything in their path. Yet, in spite of this, as I say, the revenues have increased, and last year, for the first time since American occupation, a balance of trade in favor of the islands to the extent of

\$150,000 is shown. The following table shows the increase of the total imports and exports each year:

1899.....	\$25,479,922
1900.....	40,352,504
1901.....	53,494,354
1902.....	36,069,521
1903.....	66,093,662

I am officially informed that no serious inequalities have been found in the tariff.

*To be concluded in July number*

## SOME INDICATIONS OF LAND IN THE VICINITY OF THE NORTH POLE\*

BY R. A. HARRIS,

U. S. COAST AND GEODETIC SURVEY

IT is a well established fact that there are two important surface currents (or drifts) in the Arctic Ocean. One of these flows easterly along the northern coast of Alaska, through the Arctic Archipelago, finally reaching the Atlantic Ocean through Davis and Hudson Straits. The other starts in the neighborhood of Herald Island, northwesterly from Bering Strait, and thence flows northwesterly, passing to the north of New Siberia; thence to the north of Franz Josef Land and the Spitzbergen Islands, and through Denmark Strait to and around Cape Farewell. Therefore these currents are near together when north of Bering Strait and again when in the vicinity of southern Greenland.

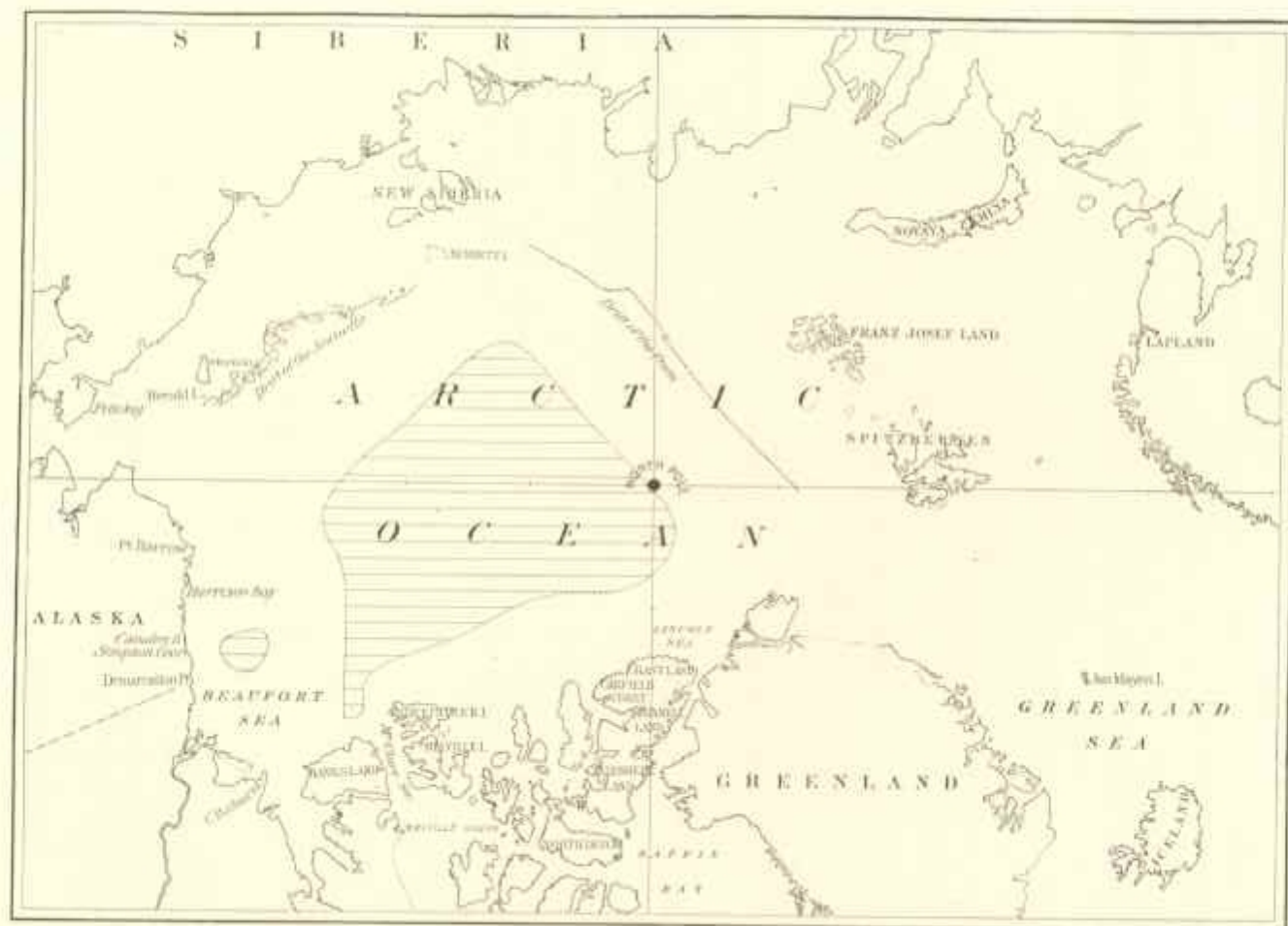
Some evidence of the American current may be cited. The ships *Advance* and *Rescue*, of the first Grinnell Expedition, were for a while carried north-

erly in Wellington Channel by the drifting ice; but when near the northern end of the channel the current reversed, and thereafter they were carried southerly and easterly through Barrow Strait, Lancaster Sound, Baffin Bay, Davis Strait to latitude 65° 30' N., where they got themselves free from the ice. The amount of southeasterly drifting measures about 1,000 nautical miles, and required a little more than six months, extending from November, 1850, to June, 1851. This gives an average rate of 5 miles per day.

In May, 1854, the British ships *Intrepid* and *Resolute* were abandoned off the western end of Barrow Strait. The *Resolute* was picked up off Cape Mercy, in the south end of Davis Strait, in September, 1855. During these 16 months 1,100 miles were covered, making an average rate of 2½ miles per day.

Strong easterly currents are encoun-

\* Read before the Philosophical Society of Washington, April 9, 1904. Communicated to the National Geographic Magazine by O. H. Tittmann, Superintendent of the U. S. Coast and Geodetic Survey.



Map of Arctic Regions, Showing Outline of Indicated North Polar Land

tered in Fury and Hecla Straits and in Bellot Strait.

Northeasterly currents off the north-western coast of Alaska have been noted by Captain Collinson,\* and easterly currents along the northern coast by Captain McClure.† Collinson noted an eastern set in Dease Strait far to the east,‡ and McClure found a large quantity of American pine, almost certainly from the Mackenzie River, drifted into Prince of Wales Strait.§

McClure Strait is constantly filled with ice, probably coming in chiefly from the west.

The existence of the current far to the north of Russia is pretty well established by the drifting of the steamship *Jeanette* from Herald Island to a point northeast of New Siberia where she was crushed in the ice, and by the subsequent drifting of some papers and clothing from the sunken vessel across the polar sea to Julianehaab, near Cape Farewell. The *Jeanette* was frozen in the ice September 6, 1879, and was crushed June 12, 1881, having made good a distance of 600 miles. During the last five of these 21 months much more than half of all the distance made good was covered, and during the last 26 days almost one-sixth. The relics were picked up in 1884, or three years after the sinking of the boat, having gone a distance of at least 2,900 miles.

Before undertaking his famous voyage in the *Fram*, Nansen adduced, as further evidence of this current, the finding on the coast of Greenland of an implement which almost certainly came from the Alaskan Eskimos in the vicinity of Bering Strait; also the prevalence of driftwood on the Greenland coasts and the north coast of the Spitzbergen

Islands, the species indicating that a large portion of this wood came from northern Siberia.

The voyage of the *Fram* verified his previous calculations in a remarkable manner. That vessel became fast in the ice at a point northwesterly from New Siberia, September 22, 1893. It thence drifted to a point north of the Spitzbergen Islands, having passed about midway between Franz Josef Land and the North Pole. It was released from the ice June 14, 1896, thus having drifted for 33 months, the distance made good being 900 miles. At the beginning of the drifting the rate of the current was a little more than half a mile per day, and increased to one mile near the end.

Having established the existence of these two prevailing surface currents, and noting that both eventually flow to southern Greenland, the question arises as to why the *Jeanette* did not drift almost due north, instead of bearing off to the west. The *Fram* went almost directly toward the eastern coast of Greenland. It is true that after the loss of the *Jeanette*, Commander De Long and his party found themselves on ice drifting rapidly northward. As already noted, the last 26 days' drifting of the boat covered about one-sixth of the entire distance. These facts suggest a broad strait north of Bennett Island, beyond which is the corner of a large tract of land dividing the deep Arctic channel traversed by the *Fram* from the shallow sea through which the *Jeanette* drifted. The final accelerated rate and northward direction of De Long's drift seem to indicate proximity to this strait.

This sea extends from Bennett Island to Banks Land. It is about 30 or 40 fathoms deep along the track of the *Jeanette*, and perhaps from 100 to 200 fathoms west of Banks Land, where it is known as Beaufort Sea.

That land probably extends to the north of Beaufort Sea can be inferred from the fact that the ice found here is

\* Collinson: *Journal of H. M. S. Enterprise*, edited by his brother, pp. 137-142.

† McClure: *The Discovery of the Northwest Passage*, edited by Osborn, p. 71.

‡ Collinson: *L. c.*, p. 291.

§ Richardson: *The Polar Regions*, p. 232.



very old, the sea seeming to have no broad outlet through which the ice can escape, as it does north of Siberia. The openings to the east are long and rather narrow channels. This does not argue against a tolerably broad expanse of water extending westward; for, the currents setting eastward prevent the ice from escaping to the west. It seems probable that land, continuous or nearly so, must extend far westward from off Banks Land; for, this supposed land and the eastward currents might well explain why it is that the ice never recedes far northward from the northern coast of Alaska nor westward from Banks Land.

Osborn thus speaks of the ice encountered by McClure in Beaufort Sea: "Ice of stupendous thickness and in extensive floes, some seven or eight miles in extent, was seen on either hand; the surface of it not flat, such as we see in Baffins Strait and the adjacent seas, but rugged with the accumulated snow, frost, and thaws of centuries."\*

Such are the arguments for the existence of a tract of land extending from near the northwest corner of Banks Land, or from Prince Patrick Island, to a point north of New Siberia, based upon the drifting of the ice on the one hand and upon its age and comparatively slight movement on the other hand.

Let us next consider what are the indications from the tides. In the first place, the tide at Point Barrow is semi-diurnal in character, with a mean range of 0.4 foot, the flood coming from the west. This can not come through Bering Strait, because the tide immediately south of the strait has scarcely 1-foot range, with a large diurnal inequality, and at a short distance north of the strait, at Pitlekaj, where the *Vega* wintered in 1878-'79, the range of the semi-diurnal tide was carefully measured and found to be only 0.2 foot. Whence

\* McClure: *L. c.*, p. 83.

comes the Point Barrow tide? It can not come from the north or east, because all observers agree that the flood comes from the west, and that it is high water on the western side of the point considerably earlier than on the eastern.\* De Long's party made careful observations upon the tide at Bennett Island, and these show a range of 2 feet. Such a range, diminished by the broadening of the shallow sea to the east of this island, might well be reduced to that found at Point Barrow, provided one considers that the range generally diminishes off headlands and capes. On the other hand, if no land exists north of Point Barrow, how can the tide there be much less than that found at Bennett Island, and how can the flood come from the west? For, practically all of the Arctic Ocean tide is derived from the Atlantic, chiefly through the Greenland Sea, and without land near the Pole one of these stations would be reached about as well as the other.

The reasons for not drawing the boundary straight from the Bennett Island corner to the Banks Land corner, but deflecting it to the south, are, first, the apparent necessity for such a bend in order that the direction of the flood may better accord with observation, and that the times of the tides of northern Alaska may be consistent with those at Bennett Island, and, second, the small north-and-south movement of the ice north of Alaska indicating that the sea is here probably narrower than it is farther west, or north of Siberia.

In the extreme north this land can not extend much beyond the Pole toward Franz Josef Land, because this would undoubtedly have there caused a bend in the track of the *Fram's* drift.

\* Thomas Simpson: *Discoveries on the North Coast of America, 1836-1839*, pp. 164, 165, 167. *Accounts and Papers, Navy*, vol. 42 (1854), p. 162.

Lieut. P. H. Ray: *Report of the International Polar Expedition to Point Barrow, Alaska*, p. 678.

Furthermore, the undiminished range of tide at Bennett Island perhaps indicates that the Nansen channel does not greatly broaden at the Pole.

Between this supposed land and the islands recently discovered by Sverdrup may be other islands, forming a continuation of the Arctic Archipelago and separated from one another by channels of moderate depths, or perhaps this land approaches the Garfield Coast and Grant Land. At any rate, the range of tide diminishes from 2 feet at Cape Sheridan to  $1\frac{1}{2}$  feet at Northumberland Sound, Penny Strait; and Lockwood and Brainard judged the tide to be small at Greely Fjord. These indicate that the access of the tide from the north is not altogether unrestricted; in fact, part of the tide at Northumberland Sound comes from the east through Belcher Channel.

We come now to another question. A few tides have been observed along the northern coast of Alaska by the explorer, Thomas Simpson.\* They show that the tide on the outer coast occurs nearly simultaneously from Point Barrow to Camden Bay and Simpson Cove. But as the international boundary line is approached a great change takes place: the tide at Demarcation Point, not 100 miles farther east, is about seven hours later in its time of occurrence. Observations are not sufficient for showing how this change takes place, but it certainly occurs. The set of the flood along the outer coast is given as easterly for all points where it has been observed from Point Barrow to and beyond Cape Bathurst; but such observations are very meager, probably on account of the smallness of the tide. This would seem to preclude the possibility of the principal part of the tide coming from the north or east; hence the probable approach of the polar land to Banks Land, or to Prince Patrick Island, or to Grant Land.

\* Simpson: *Discoveries on the North Coast of America*, 1836-'39, pp. 115, 117, 121-123, 132, 138, 161-162, 167, 178, 183.

Suppose an island about 100 miles in diameter to be separated from the coast by a shallow strait about 75 miles wide in its narrowest part. By assuming that deeper water exists to the west of the strait and island, and that the tide comes from the west, it seems possible to account for the sudden change in the time of tide; for, the main wave, going north of the island, would control the time of the tide to east of it and in Mackenzie Bay, and deep water west of the island and shallow strait would cause the tide at Camden Bay and westward to occur remarkably early, just as if this coast were at the head of a deep, suddenly-terminated canal extending northwesterly.

Immediately eastward from this supposed strait both Simpson\* and McClure† found that the waves became more like those upon a sea of some magnitude, and the latter, sailing a little north of east, found the depths to rapidly increase from 9 to 32 fathoms, and soon to 193 with no bottom.

Now, the question is, Why this more sea-like appearance, unless some huge obstruction lies immediately to the west? It may, of course, be partly due to the open water caused by the influx of the Mackenzie.

It will be of interest to note that several Arctic authorities have at various times suspected or inferred the existence of land near the Pole.

Richardson says: "The Eskimos of Point Barrow have a tradition, reported by Mr Simpson, surgeon of the *Flover* [in 1832], of some of their tribe having been carried to the north on ice broken up in a southerly gale, and arriving, after many nights, at a hilly country inhabited by people like themselves, speaking the Eskimo language, by whom they were well received. After a long stay, one spring in which the ice remained without movement they returned without mishap to their own

\* Simpson: *L. c.*, p. 176.

† McClure: *L. c.*, p. 82.



country and reported their adventures. Other Eskimos have since then been carried away on the ice, and are supposed to have reached the northern land, from whence they have not as yet returned. An obscure indication of land to the north was actually perceived from the masthead of the *Floer* when off Point Barrow.\*

On August 15, 1850, Captain McClure, anchored off Varborough Inlet, about half way from Point Barrow to Demarcation Point, writes:

"The packed ice today, as far as the eye can reach, appears solid and heavy, without a drop of water discernible. The refraction has been considerable, giving to the edge of the pack the appearance of a continuous line of chalk cliffs, from 40 to 50 feet in height. From the light shady tint, which in different parts of the pack is distinctly visible, I should be inclined to think that there may be many of the same kind of islands as those we have met with, extending to the northward, and impeding the progress of the ice, thereby keeping this sea eternally frozen."†

Captain Collinson, who wintered at Simpson Cove, 1853-1854, actually undertook a sledge journey in the spring northward, one object of which was to see if land would not be reached. The roughness of the ice caused him soon to abandon the project. He writes:

"I therefore returned, and with sorrow gave up an attempt which . . . I had looked forward to with much interest; thinking that, with anything like a favorable road, I should reach 73° N. latitude, and settle the question with regard to the open sea, which certainly does not appear to exist here in the same manner as it does to the north of the Asiatic continent."‡

In 1875 Admiral Sherard Osborn read a paper before the Royal Geographic

Society in which he predicted the existence of an archipelago or land extending from near Prince Patrick Island up very near to the Pole and thence to Wrangell Island, thus forming the northern boundary of a nearly inclosed sea.\*

A probably less happy prediction was made by Petermann, who contemplated land extending northeasterly from Greenland, thence across the Pole to Wrangell Island.

Sir Clements Markham is quoted as having said in November, 1896:

"Personally, as I do not believe in any land near the Pole, or on this side of it beyond Franz Josef Land, I trust an attempt will be made to explore another portion of the Arctic regions. I believe there is land, probably in the form of large islands, between Prince Patrick Land and the New Siberia Islands."†

Prentiss discredits there being much land north of Bering Strait, but his reasons for so doing can hardly be regarded as convincing.

#### ADDENDUM

Since reading the above paper, I accidentally came across a paper by Marcus Baker, in Volume 5 of the NATIONAL GEOGRAPHIC MAGAZINE, entitled "An Undiscovered Island off the Northern Coast of Alaska." He suggests that the supposed land be called Keenan Island. The following statements are there furnished by Captain Edward P. Herendeen, who for many years was engaged in whaling:

"It is often told that natives wintering between Harrison and Camden Bays have seen land to the north in the bright, clear days of spring.

"In the winter of 1886-'87, Uzharlu, an enterprising Eskimo of Ootkeavie,

\*The Polar Regions, p. 240.

†McClure: L. c., p. 81.

‡Collinson: L. c., p. 312.

\*Clements R. Markham: The Threshold of the Unknown, pp. 216-224.

†Prentiss: The Great Polar Current, p. 105; see also p. 19.