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**TO STUDENTS OF ARCTIC  
EXPLORATION**

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# TO STUDENTS OF ARCTIC EXPLORATION

THE GEOGRAPHIC POSITION OF CAMP JESUP, AND THE  
REDUCTION OF THE OBSERVATIONS OF R. E. PEARY,  
IN THE VICINITY OF THE NORTH POLE

by

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THOMAS H. HUBBARD, New York

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The Peary Arctic Club and the distinguished explorer whose name it bears have constantly desired scientific criticism of the observations and records made during the expedition of 1908-1909 to the North Pole.

To protect them from simulation, or other improper use, their publication has been deferred; but they have been repeatedly submitted and offered to impartial and reliable bodies qualified to determine their value.

On his return from the north and before he had reached the United States, Peary publicly declared in September 1909 that he wished to receive no honors or ovations until his right to them was settled and that his own records and proofs would be submitted forthwith to any competent body that might be selected to examine and pass upon them.

The reason for this was not that explorers, or scientists, or those who know the man, would question the correctness of Peary's own report.

Many times through a period of twenty three years he had returned from the Arctic. Sometimes he had brought back the report of unexampled success: as when twice he had crossed the interior of Greenland; as when he had defined Greenland's insularity and had rounded its extreme northern point; as when he had extended the explored limits of northern and western Grantland. Sometimes he had brought back the report of unsuccessful effort: as when in April 1902 on his sixth journey to the Arctic, he turned back at 84° 17' north latitude and wrote in his diary "The game is off. My dream of sixteen years is ended... I have made the best fight I know. I believe it has been a good one. But I cannot accomplish the impossible"; as when in April 1906, again on the

Sea Ice, he turned back at 87° 06' north latitude and wrote: "I should have liked to leave everything at this camp and push on for the one march with one empty sledge and one or two companions; but I did not dare to do this owing to the condition of the ice... In this last spurt we crossed fourteen cracks and narrow leads which, almost without exception, were in motion... I felt that the mere beating of the record was an empty bauble, compared with the splendid jewel on which I had set my heart for years and for which, on this expedition I had almost literally been straining my life out. I was more than anxious to keep on; but as I looked at the drawn faces of my comrades, at the skeleton figures of my few remaining dogs; at my nearly empty sledges and remembered the drifting ice over which we had come and the unknown quantity of the 'big lead' between us and the nearest land, I felt that I had cut the margin as narrow as could reasonably be expected. I told my men that we should turn back from here."

Always Peary has reported, as a real explorer should report, exactly what he has accomplished. Always he has given the true record, whether it was what he had hoped it might be, or fell short of his hope.

This is why, for many years, explorers and scientists have accepted his reports as true beyond cavil.

This faith in Peary was fittingly expressed by Major Darwin, the President of the Royal Geographical Society, when in conferring the Society's Special Gold Medal he greeted Peary as the only man who, since the world began, had ever led a party of his fellow creatures to one of the poles of the earth; who stated that the fact that the Society's Gold Medal had been awarded to Peary in 1898 was sufficient proof that he was an Arctic traveler of the highest reputation and who, referring to the many arduous journeys, full of dangers and difficulties and the large amount of scientific work done and the increase of Geographical knowledge accomplished by Arctic explorers, reminded his distinguished audience that Peary's expeditions formed no exception to this honorable record and that this should not be forgotten, because it had been the policy of the Society not to honor any mere race to the Pole.

It was the same faith that caused former President Roosevelt, to send from remote Africa his cordial congratulations for Peary's report of final success and, later, to write: "Commander Peary has made all dwellers in the civilized world his debtors, but above all,

we his fellow Americans are his debtors. He has performed one of the greatest feats of our times; he has won high honor for himself and for his country.

Many may think that this faith and these expressions of confidence in Peary and the cordial recognition of his great achievement attested by medals of learned societies of Europe and of his own country make further examination or discussion superfluous.

Yet there remain these reasons for scientific criticism.

The uninformed must be brought to know, as the well informed already know, that the attainment of the Pole, or of any point of latitude, is susceptible of mathematical proof and does not depend on mere assertion.

An epochal, world-important achievement should be coupled with records permanent and historic, and not merely with congratulations and speeches that are ephemeral.

Following Peary's announcement made upon his return that his records and proofs would be submitted to any competent body that might be selected to examine and pass upon them, some discussion ensued, in which he took no part, as to what selection should be made. In this discussion officials of the American Museum of Natural History of New York, the American Geographical Society of New York, the National Academy of Science, the National Geographic Society of Washington and others took part.

It resulted that at a meeting of the Board of Managers of the National Geographic Society of Washington, on October 20th, 1909, the records and observations and proofs of Commander Robert E. Peary that he reached the North Pole April 6th, 1909, were submitted to the Society. The records and observations were immediately referred to the Committee of Research with the direction that the Chairman appoint a Sub-Committee of experts of which he was to be a member, to examine the records and report on them to the board.

The Committee of experts, composed of Henry Gannett, President of the Society, Rear-Admiral Colby M. Chester and O. H. Tittman, Superintendent of the U. S. Coast and Geodetic Survey, men of the highest qualifications for the work, reported November 4th to the Society that the Committee had examined Commander Peary's original journal and records of observations, together with all his instruments and apparatus and that its members were unanimously of the opinion that he reached the North Pole on April 6th, 1909, and that the organization, planning and management



of the expedition, its complete success and its scientific results reflect the greatest credit of his ability.

The report was approved by the Society's board.

A subsequent examination by the Royal Geographical Society of London approved the result reached by the National Geographic Society.

In his annual message to Congress in December 1910 President Taft said: "The unparalleled achievement of Peary in reaching the North Pole April 6th, 1909, approved by the critical examination of the most expert scientists, has added to the distinction of our Navy to which he belongs and reflects credit upon his country. His unique success has received generous acknowledgement from scientific bodies and institutions of learning in Europe and America. I recommend fitting recognition by Congress of the great achievement of Robert Edwin Peary."

Acting upon the recommendation of President Taft the Committee on Naval Affairs of the United States House of Representatives reported a bill that authorized the President of the United States to place Peary on the retired list of the Corps of Civil Engineers of the United States Navy with the rank of Rear-Admiral to date from April 6th, 1909, with the highest retired pay of that grade under existing law. The bill also tendered to Peary the thanks of Congress for his Arctic explorations resulting in reaching the North Pole.

This bill passed both houses of Congress, was signed by President Taft March 4th, 1911, and a commission in accordance with its terms was issued to Rear-Admiral Robert E. Peary. The Committee on Naval Affairs of the United States House of Representatives, charged with the consideration of President Taft's recommendations, reported that Robert E. Peary reached the North Pole on April 6th, 1909. From a camp (Camp Jesup) which he established at a point estimated by observation at 89° 56' north latitude on said date (slightly over four miles from the exact pole) he made two excursions on that and the following day which carried him close to and beyond the pole. The Committee reached its conclusion after a careful examination and hearing by its sub-committee extending over several days at which Peary appeared in person and gave important testimony, submitting all his papers, original data, daily journal and notes of astronomical observations and soundings, etc. The Committee also heard the report of the National Geographic Society of Washington; the report from the President

and one of the Board of Governors of the Royal Geographical Society of London, which Society, through its official compute, had made independent examination of the data and proofs, and also a report from Hugh C. Mitchell and C. R. Duvall, expert computers of astronomical observations from the Coast and Geodetic Survey of the United States. These men independently of any other person, working on the original data of the observations taken by Peary, stated before the committee that on the above named dates Peary passed within a little over a mile of the exact pole and stated, in conclusion that the march of April 7th, 1909, may have carried Peary even within a stone's throw of that point.

The report of the House Committee on Naval Affairs gives by reference, or directly, the information on which the committee acted and is in itself an historic document of first importance.

The conclusions of Hugh C. Mitchell and Charles R. Duvall showing that Peary went within a mile and six tenths of the pole and possibly within a stone's throw of that mathematical point and that he went beyond the pole, are also of permanent historic importance. It is doubtful whether the difficulties of exact observations would permit a closer touch of the precise point, even if a hundred expeditions could safely reach as high latitude by travel over unobstructed routes. The Mitchell and Duvall conclusions are so convincing in themselves and are such high tributes to Peary's accurate work that their methods of computation and their mathematical processes are now given in extenso to the scientific world and to the public.

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POLE, BY HUGH C. MITCHELL C. E. AND CHARLES R. DUVALL B. S.

In this paper it is desired to present in as complete form as possible the results and discussion of the astronomic observations made by Commander (now Rear-Admiral) R. E. Peary U. S. N. and members of his party during the expedition of March and April 1909, which resulted in the discovery of the North Pole. In connection with this there are also presented certain data relating to observations made with a sextant and mercurial horizon, after the manner followed by Peary, which are intended to illustrate the possibilities of these instruments, and which throw direct light on

the question as to whether the observations submitted by Peary were physically possible, and what degree of accuracy might be claimed for them.

This paper in no way modifies the substance of the report made in February 1911, to a sub-committee of the Committee on Naval Affairs, U. S. House of Representatives, but is merely an amplification of that report, with certain additions thereto.

These computations of the observations taken by Peary and by members of his party are, for the sake of convenience, here arranged and discussed in chronological order.

For the observations of March 22, 25, and April 1, the computations are necessarily based upon the assumption that Peary was following closely the meridian of Cape Columbia. This assumption is necessary, since on each of the dates mentioned, but a single set of observations of the sun's altitude was obtained, and it not being possible to observe culmination, one element of dead reckoning, namely direction, must be introduced in order to obtain a position. How justifiable this assumption is will appear later, when the observations at Camp Jesup are reduced, for at that point two complete sets of observations taken six hours apart give a good determination of position independent of any such assumption as is stated above. It is there shown that Peary, at the end of his journey north, was within five miles of the meridian of Cape Columbia, and therefore it seems reasonable to assume that he was never at any point of the journey more than ten miles from that meridian.

It may be well at this point to state the well known fact that a single observation of the altitude of a celestial body *does not* fix the position of the observer on the earth, but determines a so-called circle of position, which is the locus of all points on the earth at which the given altitude might have been observed at the same instant. This so called circle is one which has for its center, in the case of the sun, the sub-solar point or point on the earth directly under the sun at the time of the observation, and for its radius the true zenith distance of the sun expressed as an arc of a great circle of the earth. This is only approximate as the earth is not a sphere, but the approximation is sufficiently close for navigation.

From the above it is quite obvious that if at any one point two observations be made on the sun (or other heavenly body) at different times of day, that is, separated by a time interval, two

circles of position will be determined and the point of observation will have to be at one of the two points of intersection of the two circles (since it must be on both circles).

In the case of Camp Jesup it is easy to determine by inspection which intersection fixes the position of the observer, since of the two intersections, one is near the North Pole, and the other is in or near the Antarctic regions.

We have then the position of Camp Jesup determined by that method, the graphical solution of which is known to all navigators as the Sumner Method, a method of position determination well adapted to practical navigation. These two sets of sun altitude measures, with an intervening interval of 6 hours, give the strongest possible determination of position, as is immediately seen from the practically perpendicular intersection of the Sumner lines, and as is also evident in the corresponding stability of the trigonometric solution. It would have been highly desirable to have had a complete third set of observations from the same point, and at an interval of 12 hours from either of the two sets actually taken. The resulting position would have then been practically independent of error in refraction correction, and furthermore would not have been sensitive to uncertainties in the clock correction. Additional sets of observations at about the 6-hour interval would have added much value, of course, by furnishing material from which the probable error of the position could have been determined. Definite information in regard to the motion of the ice would have also been furnished by additional observations. It must be remembered, however, that the observations were made under the most trying circumstances, when every minute of time counted, and the eyes of the observer had to be considered.

#### THE INSTRUMENTS.

All observations of the double-altitude of the sun by Peary or members of his party on the sledge expedition of March and April 1909, were made with a sextant and an artificial horizon (mercurial). The sextant was a navigators sextant of standard make, with a limb read by vernier to 10". The mercurial horizon was unique in several particulars. The trough to contain the mercury was made of wood, which provided better insulation than the metal pans ordinarily used. This wooden trough had the outer ends bevelled, to fit the sloping faces of the wind shield. The wind shield was so modified that the trough of mercury fitted