the premium had been awarded Lewis M. Haupt, professor of civil engineering at the University of Pennsylvania. This discovery of authorship was a surprise to the society, since it was thought that the author of the paper would have proved to be a member of the Coast and Geodetic Survey, of the Hydrographic Office, or of the River and Harbor Improvement Service, a number of the members of which have given much attention to the laws of ocean dynamics in determining the improvements to be made annually by the government to our rivers and harbors. The mere announcement, however, of Professor Haupt's name was confirmatory evidence of the wisdom of the society in awarding the medal. Professor Haupt, although an engineer graduate of West Point, has, during the past twenty years of civil professional life as an engineer, won such success and distinction in his profession, that the present honor which he has received only re-enforces the views which are gaining such a stronghold, — that the civilian engineer merits a standing in all government engineering work on the same basis as the regularly commissioned officers.

Tersely, the object of the paper presented to the society was to collate certain observed facts for the purpose of explaining the physical phenomena of harbor entrances, and of deducing therefrom conclusions of practical value in the economical solution of the problem of improving the channels and shelterings of harbors.

What was claimed in the paper as meriting the favorable judgment of the society is briefly outlined by the author as follows: —

"1. The determination of the character, direction, and relative intensities of the forces acting upon any harbor entrance, from a study of the submerged topography and other local physical features.

"2. The discovery of the existence of typical form, in the sandy spits bordering the entrance, which will in general indicate the direction of the resultant movement.

"3. The recognition of the fact that the proper place for the ebb discharge, or channel over the bar, is as far removed as may be from the point of direct attack of the flood resultant, when the direction of the latter is not normal to the coast.

"4. The definite enunciation of the principle that the trend of the coast with reference to the cotidal line will in general indicate at once the proper position for defensive works.

"5. The presentation of an original form (in plan) of breakwater, whereby the natural agencies are materially aided, without serious interference with either the flood or ebb forces.

"6. A method of improvement whereby the internal currents are concentrated and conserved for more efficient scour after passing the gorge.

"7. A plan for utilizing the natural tendencies of the flood to cut a beach channel which shall be available for the lighter-draught vessels.

"8. The enunciation of the principle that the cause of the angular movement of the ebb stream after egress is due to the general form of the exterior coast-line, which causes a racing of the tidal crests, from the outer capes towards the bight of the bay, and that the flood components thus generated are the forces which build the bars and shift the inlets. This incessant semi-diurnal action of the flood is the controlling element in the forces affecting the magnitude and position of the bar. Storms and winds may modify and shift the deposits, but eventually the flood re-establishes the original conditions.

"9. The free circulation and ingress given to the flood by the detached breakwater, so designed as both to oppose the flood and produce interfering waves which deposit sand outside of the channel, whilst it also aids the ebb in its attack on the bar by defending its channel and concentrating its volume.

"10. For a given site and stage of water, the flood movement approaches in the same direction, hence the resisting and regulating works should be placed on the near side of the proposed channel. If on the far side, they would be worse than useless, unless for shore protection.

"11. No artificial re-opening of an outlet which has been closed by this flood component can be maintained without auxiliary works to deflect and modify its action. Dredging is only justified when the interests of navigation are sufficient to maintain a continuance of the expense, and no other reasonable methods are available.

"12. The ability resulting from these general principles to construct works requiring a lesser linear development which will produce greater navigable depths at less cost.

"13. The abolition of the risks and difficulties attending the navigation of narrow jetty entrances in times of danger.

"14. It frequently happens that the requirements of navigation and tidal concentration are conflicting: the former demanding wide entrances; the latter, on account of insufficient tidal volume, narrow ones. This debars the usual jetties, and prevents improvement. The plans herein proposed are eminently adapted to meet such contingencies."

The last-mentioned condition applies in a significant way to the conditions at Absecon and other inlets.

The phenomena of tidal movements, and their bearing upon the formation and destruction of barriers in harbor basins, are of course influenced not only by the topography of the coast-line, but by that of the bottom of the harbor itself, both of which features are in turn perpetuated or changed in form by the relative resistance of the material forming the bottom of the harbor, and the direction and force of currents due to fresh water and tidal movements, winds, and waves. Yet, at the same time, little has been correctly understood as to the laws governing these movements. The new conditions which Professor Haupt so ably enunciates in his paper throw much light on the study of the history of our offshore waterways, as shown by an inspection of those extending along the Atlantic coast, as exhibited by the Coast Survey charts. This is particularly realized in an examination of our southern bay, extending from Cape Florida to Cape Hatteras, and of our middle bay, from Cape Hatteras to Nantucket. The application by Professor Haupt, of his principles and discovery to local conditions along this coast-line, is unique and forcible. It is certainly evident to an intelligent and experienced engineer, as Professor Haupt himself indicates, that, if it is proposed to aid nature, the engineer "must so design his external works as to prevent the flood-tide from carrying sand into the channel to obstruct the ebb and require more work of it for its removal." His system is based upon an internal concentration of the ebb currents in their path to the gorge, and of their external conservation after passing through this section to the ocean.

A paper narrating a discovery so important in ocean dynamics as this, cannot be fully reviewed or fairly treated in a brief space; but one of the most convincing arguments in support of the conditions enumerated above is the application of the discovery to the cause and direction of the tidal movements in Barnegat Inlet as bearing upon the location of the light-house which was erected in 1834, but which was subsequently destroyed prior to the erection of the second structure in 1858. This latter structure has been ineffectually 'protected' by a system of jetties, and it is now evident, in the light of the investigation of this particular case, that the structure has been improperly placed on the spit opposed to the flood resultant. If the light had been placed on the north spit, the interests of navigation would, no doubt, have been as well protected, and all the defensive works which have been constructed at great cost to the government would have been rendered entirely unnecessary.

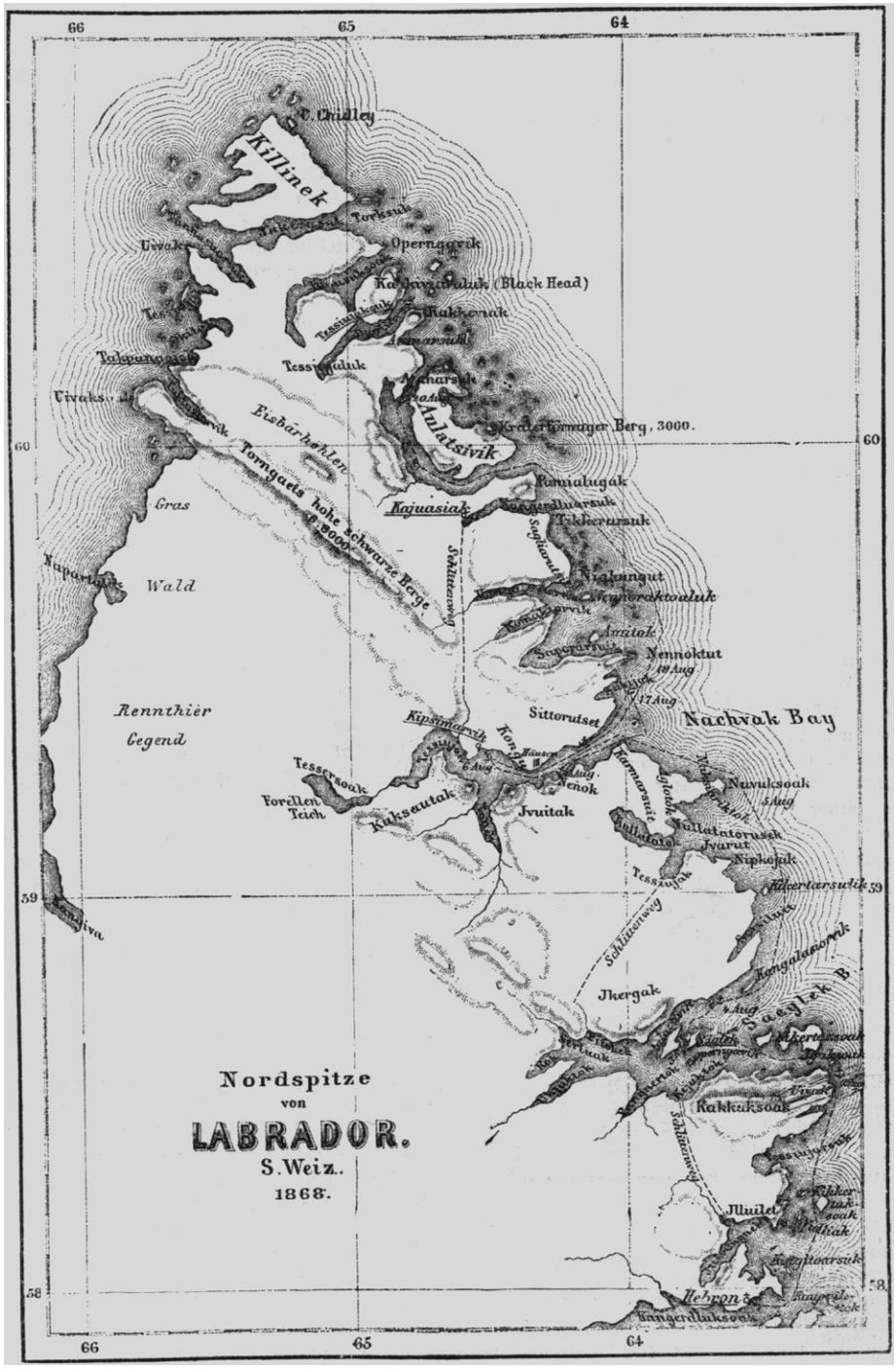
Lentz, in his 'Ebb and Flow of Tides,' says, "The intricate, theoretical, tide-generating conditions are complicated by a number of circumstances, forming a bewildering labyrinth of causes and results, through which the human mind cannot find its way." When one bears in mind such a statement from an authority so high, too much cannot be said in praise of Professor Haupt's discovery in its bearing on "useful improvements relating to navigation" as well as "natural philosophy," and of the high honor conferred upon him by the American Philosophical Society in awarding him the Magellanic premium. C. A. A.

EXPLORATION AND TRAVEL.

Notes on the Geography of Labrador.

THE December number of the *Bulletin of the American Geographical Society* contains a paper by A. S. Packard on the physical geography of Labrador. The paper is accompanied by a map of Labrador, compiled by F. Leuthner, and said to show the present state of our knowledge. It is founded on the British

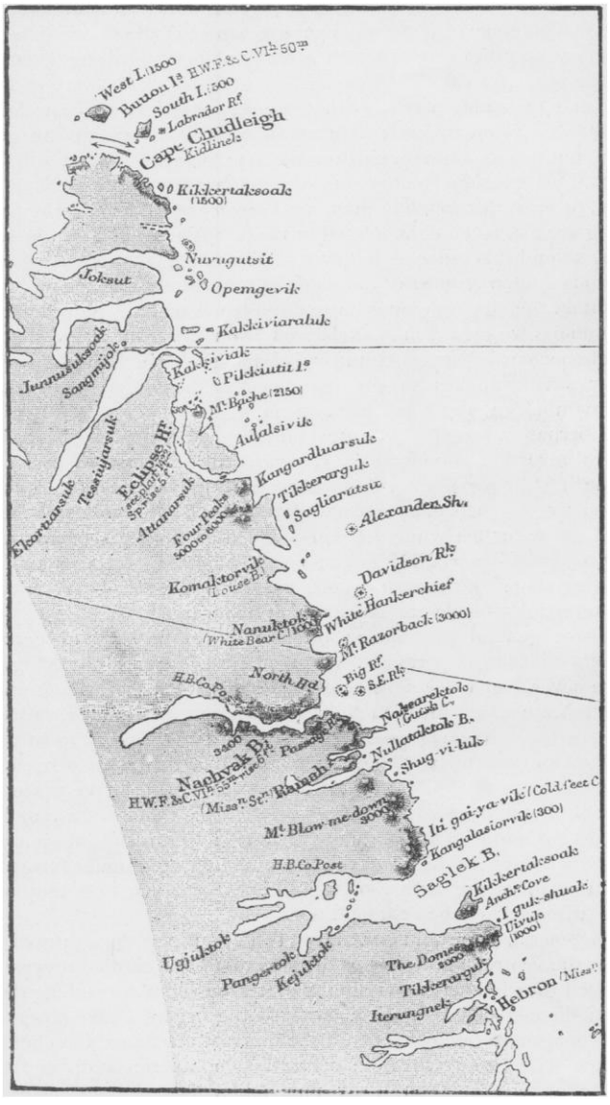
Admiralty maps and a manuscript map by S. Weiz, a Moravian missionary who visited the northern parts of the coast of Labrador. The latter was published in January, 1869, in the *Missionsblatt aus der Brüdergemeinde*, and we reprint it here side by side with the latest British Admiralty map (No. 863, Hudson Bay and Strait) for comparison. It will be seen that the geographical positions, as well as the coast-lines, show many discrepancies; so much



so, that it is impossible to compile them into one map. The positions of the admiralty map are comparatively correct; but it may be assumed that the outlines of the coast, and the names and positions of the islands, are better on Weiz's map, as he gathered his information from Eskimo who are well acquainted with the coast. Unfortunately the admiralty maps of these regions are not up to date, and are therefore extremely deficient. The maps 'Arctic Sea' (No. 2177), for instance, the eastern sheet of which bears the mark, "Large corrections: April, 1882, June, 1885," show Greely's discoveries, but not the valuable work done by Danish, American, German, and French explorers. The same is the case in the sheet mentioned above, which was published in 1884. Evidently neither Weiz's nor the British maps are founded on reliable observations. Weiz's route on board the schooner 'Meta' is shown on his map, and it will be seen that he did not visit the deep fiords. The nomenclature of the British maps is very deficient, the local names of places being misspelled so as to become almost unintelligible. As we find, instead of *T*, *J* in most parts of the coast, I concluded that the original is a manuscript of a German missionary, the *T* in a German handwriting being similar to an English *J*.

Besides the explorations mentioned by Packard, a considerable amount of work has been done in Labrador and the adjacent parts of the country. Lake Mistassini was explored in 1884–85 by an

expedition sent out jointly by the Geological Survey of Canada and the commissioner of crown lands of Quebec. The latter has recently sent surveyors who explored the numerous rivers emptying into the St. Lawrence. I mention particularly C. E. Forgues's survey of the rivers St. John, Mingan, Natashquan, and Esquimaux. Last summer the missionary Edmund James Peck succeeded in crossing Labrador from Richmond Bay to Ungava Bay. Green Island, in Hudson Bay, as shown on Packard's map, does not exist according to observations made by Gordon on his expeditions to Hudson Bay. The archives of the Department of Marine of France possess a number of manuscript maps of Hudson Strait, which, however, have not been published.



LABRADOR, FROM THE BRITISH ADMIRALTY MAP NO. 863.

An interesting sketch of the physical geography of Labrador was given by Dr. R. Koch, who wintered in Nain in 1882–83, and visited the stations of the Moravian missionaries. He describes the country in the *Deutsche Geographische Blätter* (vol. vii. No. 2, 1884). The outlying islands are barren and destitute of vegetation; the valleys adjoining the bays and fiords, however, have beautiful forests of pine and larch, surrounding dark, quiet lakes. Towards the mountainous region the woods are lighter, and the numerous dead trunks testify to their struggle against the gales of winter. Travelling by sledge westward from Nain, the plateau of the interior is reached after four or five days' travel, of about thirty miles each, through fiord-like valleys. After one or two days more, the height of the land is reached. The height of the land approaches the shore in the northern parts of the peninsula, being only one day's journey distant from Rama. The narrower the mountainous district becomes, the higher it is. Near Hoffenthal the mountains do not exceed a few hundred feet in height. At Nain the mountains close by the sea are from eight hundred to twelve hundred feet high. The Kiglapait, between Nain and Okak, have an elevation of several thousand feet. North of Hebron the country is alpine in character, the mountains rising almost vertically from the sea. Deep, narrow fiords intersect the coast, which is not sheltered by islands from the heavy swell of the ocean. But, although the peaks attain a great height, no extensive snow-fields and glaciers are found. From Hebron to Komaktorvik there are hardly any islands off the coast, but farther north it is skirted by innumerable dangerous rocks. Near Rama, Koch ascended a mountain twenty-six hundred feet in height. He describes the scene as very grand: "At my feet I saw the deep bluish-green fiord surrounded by steep, wall-like cliffs. The mountains were covered with shrubs colored red by the first frost of the season. To the left spreads the dark blue ocean, with its greenish-white icebergs. On the opposite side of the fiord, and towards the west, extended steep and ragged mountains, and narrow gorge-like valleys, in one of them a dark lake, the water of which, black as ink, reflected the high peaks. In the interior I saw mountains rising to still greater heights, and covered with fresh snow extending north and south as far as I could see. The highest points of this range are opposite the island of Aulatsivik, and reach elevations of from eight thousand to nine thousand feet. While mountains less than fifteen hundred or two thousand feet in height are rounded, and bear evidence of having been covered by glaciers, the ragged forms of the higher mountains show no such signs." Continuing, Koch describes the terraces and lakes formed by the rivers and the old beaches, which he found in several bays as high as one hundred feet above the level of the sea.

Some additional information is contained in the publication of the reports of the German polar stations of the international system. Since Koch's visit to Labrador, meteorological observations are being made at all missionary stations of the Labrador coast, which are of particular value as filling the wide gap between the system of Canada and the Danish stations in Greenland.

PHYSIOLOGICAL AND PATHOLOGICAL REVERSION.

WRITERS on evolution, and especially Darwin, have endeavored to explain many curious facts in the forms, colors, and general appearance of animals by reversion to a condition existing in ancestors more or less remote. As this explanation has seemed to be the only one that met the cases, it has been largely accepted. But, so far as I know, physiological and pathological reversion in the sense in which the terms are used in this paper, has not been employed to any appreciable degree by writers of any class to explain phenomena which seem to me to gather fresh interest around them, and appear in a new light when thus viewed.[1] By physiological reversion I mean a return to a condition functionally similar to, if not identical with, that existing in some lower form; and by pathological reversion, an analogous result dependent on a disordered condition (disease).

It is now almost superfluous to point out that the embryo of the highest mammals passes through stages of development closely allied to the permanent forms of groups of animals lower in the scale. But that there is also a close functional resemblance in many particulars has not been much insisted upon. The subject is so large that the various adaptations in the embryo to an environment that is but temporary can be only indicated, and not treated in detail. It is plain that the embryo of the mammal, being surrounded by a fluid medium and drawing the oxygen supplies for its tissues independently of any actual contact with an atmosphere, must resemble functionally aquatic animals proper in many respects. It breathes by the placenta, virtually as the fish and other aquatic animals by gills. The condition of the blood puts it on a par with lower forms; and, even in the highest intra-uterine stage of develop-

[1] It was not till long after this paper had been written, and a considerable time after it had been read before the Medico-Chirurgical Society of Montreal, that I became aware that the principle involved in the discussion had been previously announced by Dr. Milner Fothergill of London in a communication printed in the *Medical Press and Circular* for August, 1886. I am glad, however, to be able to make this acknowledgment on behalf of so bold and original a writer as Dr. Fothergill.