On the Construction of Isochronic Passage-Charts

Author(s): Francis Galton

Source: *Proceedings of the Royal Geographical Society and Monthly Record of Geography*, New Monthly Series, Vol. 3, No. 11 (Nov., 1881), pp. 657-658

Published by: Wiley on behalf of The Royal Geographical Society (with the Institute of British Geographers)

Stable URL: http://www.jstor.org/stable/1800138

Accessed: 26-06-2016 15:53 UTC

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By Francis Galton, F.R.S.*

Map, p. 704.

By "isochronic" passage-charts, I mean charts constructed to show the extreme distances that can be traversed in "equal times" from a common starting-point. Their principle is an extension of that by which the rise and fall of temperature as we proceed in different directions is shown by means of isothermic lines, or again as that of barometric pressure is shown by the isobaric lines which may be seen in the small weather chart published daily in the *Times*.

In the accompanying map the starting-point is London, and the travellers are supposed to use postal or other rapid or regular conveyances so far as they help, and thence to employ such private means of conveyance as the country may afford. I assume the seasons to be favourable, that immunity has been obtained from political obstructions, and that friends on the spot have made preparations to avoid delay in engaging travelling servants, beasts of burden, or boats. I have kept the idea in view of a special correspondent calculating how long it would take for his letters to reach his employers, under the best arrangements he could make without an extravagant cost. The sea isochrones are for the most part drawn through the points reached by the various passenger steamers in the corresponding number of days. In the Arctic regions the estimates are necessarily rude; they have been based on recent voyages. All places within ten days' journey of London are coloured green, those between ten and twenty are orange, between twenty and thirty they are red, between thirty and forty they are blue, and those beyond forty are brown.

The data upon which the map is based are (1) the time-tables of the principal ocean steam-packet companies. (2) A list which has lately appeared in the Postal Guide of the average time taken by the post to reach various places. (3) Private information furnished to me by friends, including some officials at the General Post Office. (4) Records of voyages. By these means I obtained data for a considerable number of important ports and other places distributed over the globe, and I procured as I best could the particulars concerning the chief local lines by sea and land proceeding from those places. In this way the skeleton of the chart was formed, which I filled up by means of measurements based on the average length of a day's journey in the country under consideration. I think there is no estimate in the chart that does not admit of defence, but I freely acknowledge that judgments may greatly differ in many cases as to whether a different estimate might not have been

* Read at the Geographical Section of the British Association, York Meeting, September 1st, 1881.

preferable. A common subject of doubt is whether to adopt the time occupied by the regular and roundabout communication, or that by an occasional direct one. Instances of this are found all along the West Coast of Africa, where the ports are regularly served by steamers that touch at every one of them in succession, and which consequently occupy more than forty days to reach even the mouth of the Congo, whereas steamers occasionally sail direct to one or other of those ports in considerably shorter time than these mail steamers. This particular difficulty is met and explained by the sea isochrones, which in this case do not conform to those of the land. It will be seen that the sea adjacent to the greater part of West Africa lies within the yellow band, and therefore that a ship going direct to any point within that band and steaming at the same rate as the mail steamer to the Cape, Pará, or St. Thomas, would arrive at its destination in from ten to twenty days.

In a map on a larger scale than this, many more details could and ought to be given, including at least the great through routes by sea and land, but the present map is too small for the purpose. It is offered merely as generalisation with the primary object of illustrating a new principle, which perhaps may hereafter be developed in more elaborate publications. The principle could be adapted in many ways for the convenience of tourists; thus isochronic maps might be easily constructed for Continental travel or for home excursions.

GEOGRAPHICAL NOTES.

The Jeannette Expedition.—Public interest in the fate of the *Jeannette* is perceptibly increasing as the autumn wears away without any tidings being received of her whereabouts. Neither the revenue cutter *Corwin*, nor the *Rodgers*, has yet found any traces of the missing vessel, although the former is reported to have reached and landed on Wrangell Land. Still there is no ground for despairing of the safety of the crew, and perhaps of the vessel, as the expedition was provisioned for three years, and the search up to the date of the latest news had not reached very far. Professor Nordenskiöld has communicated to the *New York Herald* various items of news from the Siberian coast, which may, or may not, have reference to the missing expedition. One of them is to the effect that the commander of the *Lena* (the Professor's steam tender left by him in the river of the same name) had heard that a Yakut had seen a steamer at the mouth of the Lena on the 13th of September, 1879; and the other that the *Louise*, a trading steamer which has made the voyage this summer between the Yenisei and Norway, reported that some Samoiedes had found last winter (1880–1) near the mouth of the Yenisei the corpses of two Europeans and a