the *point attractive.* It is at any rate certain that Gonzales Oviedo and Sebaſtian Cabot obſerved it in their voyages. Indeed it could not poſſibly eſcape them ; for in ſome parts of their ſeveral tracks the needle deviated above 25 degrees from the meridian ; and the rudeſt dead reckoning, made on the ſuppoſition of the needle pointing due north and ſouth, muſt have thrown the navigators into the utmoſt confuſion. It would indeed be very difficult for them, un­prepared for this ſource of error, to make any tolerable gueſs at its quantity, till they got to ſome place on ſhore, where they could draw a meridian line. But we know that ſpherical trigonometry was at that time abundantly familiar to the mathematicians of Europe, and that no perſon pre­tended to take the command of a ſhip bound to a diſtant port that was not much more informed in this ſcience than moſt maſters of ſhips are now-a-days. It could not be long, therefore, before the methods were given them for diſcovering the variation of the compaſs by obſervation of Am­plitudes and Azimuths, as is practiſed at preſent (ſee each of theſe articles). But the deviation of the compaſs from the meridian was not generally allowed by mathe­maticians, who had not yet become ſenſible of the neceſſity of quitting the Ariſtotelean trammels, and inveſtigating na­ture by experiments. They rather choſe to charge the navigators with inaccuracy in their obſervations than the schoolmen with error in principles. Pedro de Medina at Valladolid, in his *Arte de Naviggar,* publiſhed in 1545, poſitively denies the variation of the compaſs. But the concur­ring reports of the commanders of ſhips on diſtant voyages, in a few years, obliged the landſmen in their cloſets to give up the point ; and Martin Cortez, in a treatiſe of navigation, printed at Seville before 1556, treats it as a thing completely eſtabliſhed, and gives rules and inſtruments for diſcovering its quantity. About the year 1580 Norman publiſhed his diſcovery of the *dip of* the needle, and ſpeaks largely of the horizontal deviation from the plane of the meridian, and attributes it to the attraction of a point, not in the heavens, but in the earth, and deſcribes methods by which he hoped to find its place. To the third, and all the subſequent editions of Norman’s book (called the new *attrac­tive),* was ſubjoined a dissertation by Mr Burroughs, comp­troller of the navy, on the variation of the compaſs, in which are recorded the quantity of this deviation in many places ; and he laments the obſtacle which it cauſes to na­vigation by its total uncertainty previous to obſervation. The author indeed offers a sort of rule for computing it a *priori,* founded on ſome conjecture as to its cauſe ; but, with the modeſty and candour of a gentleman, acknowledges that this is but a gueſs, and intreats all navigators to be aſſiduous in their obſervations, and liberal in communicating them to the public ; conjuring them to conſider, that an intereſted regard to their own private advantage, by conceal­ing their knowledge, may prove the ſhipwreck of thouſands of brave men. Accordingly obſervations were liberally con­tributed from time to time, and were publiſhed in the ſubſequent treatiſes on navigation.

But in 1635 the mariners were thrown into a new and great perplexity, by the publication of a *Diſcourſe mathema­tical on the vacation of the Magnetical Needle,* by Mr Henry Gillebrand, Greſham professor of aſtronomy. He had com­pared the variations obſerved at London by Burroughs, Gun­ter, and himſelf, and found that the north end of the mari­ner’s needle was gradually drawing more to the weſtward. Eor Norman and Burroughs had obſerved it to point about 11½ degrees to the eaſt of the north in 1580; Gunter found its deviation only 6¼ in 1622, and he himſelf had obſerved only 4⁰ in 1634 ; and it has been found to deviate more and more to the weſtward ever ſince, as may be ſeen from the following little table in Waddington’s Navigation.

|  |  |  |  |
| --- | --- | --- | --- |
| London. | | | |
| 1576 | Norman | 11⁰15' | Eaſt. |
| 1580 | Burroughs | 11.17 |  |
| 1622 | Gunter | 6.12 |  |
| 1634 | Gillebrand | 4∙ *5* |  |
| 1662 |  | 0. 0 |  |
| 1666 | Sellers | 0.34 | Weft |
| 1670 |  | 2.06 |  |
| 1672 |  | 2.30 |  |
| 1700 |  | 9.40 |  |
| 1720 |  | 13. |  |
| 1740 |  | 16.10 |  |
| 1760 |  | 19.30 |  |
| 1774 |  | 22.20 |  |
| 1778 | Phil. Tranſ. | 22.11 |  |

Mr Bond, teacher of mathematics in London, and employed to take care of and improve the impreſſions of the popular treatiſes of navigation, about the 1650, decla­red, in a work called the “ Seaman’s Kalendar,” that he had diſcovered the true progreſs of the deviation of the compaſs ; and publiſhed in another work, called the “ Lon­gitude Found,” a table of the variation for 50 years. This was, however, a very gratuitous sort of prognoſtication, not founded on any well-grounded principles ; and though it tallied very well with the obſervations made in London, which ſhowed a gradual motion to the weſtward at the rate of— .12' annually, by no means agreed with the obſerva­tions made in other places. See Phil. Tranſ. 1668.

But this glad news to navigators ſoon lost its credit : for the inconſiſtency with obſervation appeared more and more every day, and all were anxious to diſcover ſome general rule, by which a near gueſs at leaſt might be made as to the direction of the needle in the moſt frequented ſeas. Mr Halley, one of the firſt geometers and moſt zealous philoſophers of the laſt century, recommended the matter in the moſt earneſt manner to the attention of government ; and, after much unwearied ſolicitation, obtained a ſhip to be ſent on a voyage of diſcovery for this very purpoſe. He got the command of this ſhip, in which he repeatedly traverſed the Atlantic Ocean, and went as far as the 50th degree of ſouthern latitude. See his very curious ſpeculations on this ſubject in the Phil. Tranſ. 1683 and 1692.

After he had collected a prodigious number of obſerva­tions made by others, and compared them with his own, he publiſhed in 1700 a ſynoptical account of them in a very ingenious form of a ſea chart, where the ocean was crossed by a number of lines passing through thoſe planes where the compaſs had the same deviation. Thus, in every point of one line there was no variation in 1700; in every point of another line the compaſs had 20 degrees of eaſt variation; and in every point of a third line it had 20⁰ of west varia­tion. Theſe lines have ſince been called *Halleyan lines,* or curves. This chart was received with univerſal applauſe, and was undoubtedly one of the moſt valuable preſents that ſcience has made to the arts. But though recommended with all the earntſtneſs which its importance merited, it was offered with the candour and the caution that characteriſes a real philoſopher ardently zealous for the propaga­tion of true knowledge. Its illuſtrious author reminds the public of the inaccuracy of obſervations collected from every quarter, many of them made by persons not ſufficiently inſtructed, nor provided with proper inſtruments ; many alſo without dates, and moſt of them differing in their dates, ſo that ſome reduction was necessary for all, in order to bring them to a common epoch ; and this muſt be made without