

every direction over the Earth's surface.* In the former case, the simultaneous manifestation of the storm may serve, with certain limitations, like Jupiter's satellites, fire-signals, and well-observed falls of shooting stars, for the geographical determination of degrees of longitude. We here recognize with astonishment that the perturbations of two small magnetic needles, even if suspended at great depths below the surface, can measure the distances apart at which they are placed, teaching us, for instance, how far Kasan is situated east of Göttingen or of the banks of the Seine. There are also districts in the earth where the mariner, who has been enveloped for many days in mist, without seeing either the sun or stars, and deprived of all means of determining the time, may know with certainty, from the variations in the inclination of the magnetic needle, whether he is at the north or the south of the port he is desirous of entering.†

* There are also perturbations which are of a local character, and do not extend themselves far, and are probably less deep-seated. Some years ago I described a rare instance of this kind, in which an extraordinary disturbance was felt in the mines at Freiberg, but was not perceptible at Berlin. (*Lettre de M. de Humboldt à Son Altesse Royale le Duc de Sussex sur les moyens propres à perfectionner la Connaissance du Magnétisme Terrestre*, in Becquerel's *Traité Expérimental de l'Électricité*, t. vii., p. 442.) Magnetic storms, which were simultaneously felt from Sicily to Upsala, did not extend from Upsala to Alten. (Gauss and Weber, *Résultats des Magnet. Vereins*, 1839, § 128; Lloyd, in the *Comptes Rendus de l'Acad. des Sciences*, t. xiii., 1843, Sém. ii., p. 725 and 827.) Among the numerous examples that have been recently observed, of perturbations occurring simultaneously and extending over wide portions of the Earth's surface, and which are collected in Sabine's important work (*Observ. on Days of unusual Magnetic Disturbance*, 1843), one of the most remarkable is that of the 25th of September, 1841, which was observed at Toronto in Canada, at the Cape of Good Hope, at Prague, and partially in Van Diemen's Land. The English Sunday, on which it is deemed sinful, after midnight on Saturday, to register an observation, and to follow out the great phenomena of creation in their perfect development, interrupted the observations in Van Diemen's Land, where, in consequence of the difference of the longitude, the magnetic storm fell on the Sunday. (*Observ.*, p. xiv., 78, 85, and 87.)

† I have described, in Lamétherie's *Journal de Physique*, 1804, t. lix., p. 449, the application (alluded to in the text) of the magnetic inclination to the determination of latitude along a coast running north and south, and which, like that of Chili and Peru, is for a part of the year enveloped in mist (*garua*). In the locality I have just mentioned, this application is of the greater importance, because, in consequence of the strong current running northward as far as to Cape Pareña, navigators incur a great loss of time if they approach the coast to the north of the haven they are seeking. In the South Sea, from Callao de Lima harbor to Truxillo, which differ from each other in latitude by $3^{\circ} 57'$