be conceived. Something like it is to be ſeen at Gibraltar. It is high water on the eaſt side of the rock about 10 o’clock at full and change, and it is high water on the weſt side, not a mile diſtant, at 12. This difference is per­haps the chief cause of the singular current which is ob­ſerved in the Straits mouth. There are three currents obſerved at the ſame time, which change their directions every 12 hours. The ſmall tide of the Mediterranean pro­ceeds along the Barbary ſhore, which is very uniform all the way from Egypt, with tolerable regularity. But along the northern side, where it is greatly obſtructed by Italy, the iſlands, and the eaſt coaſt of Spain, it ſets very irregu­larly ; and the perceptible high water on the Spaniſh coaſt differs four hours from that of the ſouthern coaſt. Thus it happens, that one tide ranges round Europa point, and ano­ther along the ſhore near Ceuta, and there is a third current in the middle different from both. Its general direction is from the Atlantic Ocean into the Mediterranean Sea, but it ſometimes comes out when the ebb tide in the Atlantic is conſiderable.

Suppoſe the moon over the middle of the Mediterranean. The surface of the ſea will be level, and it will be half tide at both ends, and therefore within the Straits of Gibral­tar. But without the Straits it is within half an hour of high water. Therefore there will be a current ſetting *in* from the Atlantic. About three and an half hours after, it is high water within and half ebb without. The cur­rent now ſets out from the Mediterranean. Three hours later, it is low water without the Straits and half ebb within ; therefore the current has been ſetting out all this while. Three hours later, it is half flood without the Straits and low water within, and the current is again setting in, &c.

Were the earth fluid to the centre, the only ſenſible mo­tion of the waters would be up and down, like the waves on the open ocean, which are not bruſhed along by ſtrong gales. But the ſhallowneſs of the channel makes a horizon­tal motion neceſſary, that water may be ſupplied to form the accumulation of the tide. When this is formed on a flat ſhelving coaſt, the water muſt flow in and out, on the flats and ſands, while it riſes and falls. Theſe horizontal motions muſt be greatly modified by the channel or bed along which they move. When the channel contracts along the line of flowing water, the wave, as it moves up the channel, and is checked by the narrowing ſhores, muſt be reflected back, and keep a-top of the waters ſtill flowing in underneath. Thus it may riſe higher in theſe narrow ſeas than in the open ocean. This may ſerve to explain a little the great tides which happen on ſome coaſts, ſuch as the coaſt of Normandy. At St Malo the flood frequently riſes 50 feet. But we cannot give any thing like a full or ſatisfactory account of theſe singularities. In the Bay of Fundy, and particularly at Annapolis Royal, the water ſometimes riſes above 100 feet. This ſeems quite inexpli­cable by any force of the sun and moon, which cannot raiſe the waters of the free ocean more than eight feet. Theſe great floods are unqueſtionably owing to the proper timing of certain oſcillations or currents adjoining, by which they unite, and form one of great force. Such violent motions of water are frequently ſeen on a ſmall ſcale in the motions of brooks and rivers ; but we are too little acquainted with hydraulics to explain them with any preciſion.

We have ſeen that there is an oſcillation of waters form­ed under the ſun and moon ; and that in conſequence of the rotation of the earth, the inertia and the want of perfect fluidity of the waters, and obſtructions in the channel, this accumulation never reaches the place where it would finally ſettle if the earth did not turn round its axis. The consequence of this muſt be a general current of the waters from eaſt to weſt. This may be ſeen in another way. The moon in her orbit round the earth has her gravity to the earth diminiſhed by the sun’s diſturbing force, and therefore moves in an orbit leſs incurvated than ſhe would deſcribe in­dependent of the ſun’s action. She therefore employs a longer time. It the moon were ſo near the earth as almoſt to touch it, the same thing would happen. Therefore ſup­poſe the moon turning round the earth, almoſt in contact with the equator, with her natural undiſturbed periodic time, and that the earth is revolving round its axis in the ſame time, the moon would remain continually above the ſame ſpot of the earth’s ſurface (ſuppoſe the city of Quito), and a ſpectator in another planet would ſee the moon al­ways covering the ſame ſpot. Now let the ſun act. This will not affect the rotation of the earth, becauſe the action on one part is exactly balanced by the action on another. But it will affect the moon. It will move more ſlowly round the earth’s centre, and at a greater diſtance. It will be left behind by the city of Quito, which it formerly co­vered. And as the earth moves round from weſt to eaſt, the moon, moving more ſlowly, will have a motion to the weſt with reſpect to Quito. In like manner, every particle of water has its gravity diminiſhed, and its diurnal motion retarded ; and hence ariſes a general motion or current from eaſt to weſt. This is very diſtinctly perceived in the At­lantic and Pacific Oceans. It comes round the Cape of Good Hope, ranges along the coaſt of Africa, and then sets directly over to America, where it meets a ſimilar ſtream which comes in by the north of Europe. Meeting the ſhores of America, it is deflected both to the south along the coaſt of Brazil, and to the north along the North American ſhores, where it forms what is called the *Gulf Stream,* becauſe it comes from the Gulf of Mexico. This motion is indeed very slow, this being ſuſſicient for the ac­cumulation of ſeven or eight feet on the deep ocean ; but it is not altogether inſenſible.

We may expect differences in the appearances on the weſtern ſhores of Europe and Africa, and on the weſtern ſhore of America, from the appearances on the eaſtern coaſts of America and of Asia, for the general current obſtructs the waters from the weſtern ſhores, and ſends them to the eaſtern ſhores. Alſo when we compare the wide opening of the northern extremity of the Atlantic Ocean with the narrow opening between Kamtſchatka and Ame­rica, we ſhould expect differences between the appearances on the weſt coaſts of Europe and of America. The obſervations made during the circumnavigations of Captain Cook and others ſhow a remarkable difference. All along the weſt coaſt of North America the inferior tide is very tri­fling, and frequently is not perceived.

In the very ſame manner, the diſturbing forces of the ſun and moon form a tide in the fluid air which ſurrounds this globe, conſiſting of an elevation and depreſſion, which move gradually from eaſt to weſt. Neither does this tide ever at­tain that poſition with respect to the diſturbing planets which it would do were the earth at reſt on its axis. Hence ariſes a motion of the whole air from eaſt to weſt ; and this is the principal cauſe of the trade-winds. They are a little accelerated by being heated, and therefore expanding. They expand more to the weſtward than in the oppoſite direction, becauſe the air expands on that ſide into air, which is now cooling and contracting. Theſe winds very evidently fol­low the sun’s motion, tending more to the south or north as he goes ſouth or north. Were this motion conſiderably af­fected by the expansion of heated air, we ſhould find the air rather coming northward and ſouthward from the torrid