for ſalt water requires a much greater degree of cold to freeze it than freſh water. It was this circumſtance, probably, together with its conſtant motion, which in­duced the ancients to believe that the ſea never froze. Even among the moderns it has been a generally re­ceived opinion, that ſea-ice is originally formed in ri­vers. Buffon has made the great quantities of ice with which the South ſea abounds an argument for the exiſtence of a continent near the Antarctic pole. But it is now well known that great quantities of ice are formed at a diſtance from land. Sea-ice is of two kinds; field ice, which extends along the ſhore, and is only two or three feet thick; and mountain ice, which abounds in the middle of the ocean. The ſize of theſe moun­tains is ſometimes prodigious. The ſea-ice is always freſh, and has been often of great uſe to navigators. The weight of ſea-water is to that of river-water as 73 to 70; that is, a cubic foot of ſea-water weighs 73 lb. while the ſame quantity of river-water weighs only 70lb.; but this proportion varies in different places. It is worthy of our attention, too, that the water at the ſurface of the ſea contains leſs ſalt than near the bottom; the difference indeed is inconſiderable, but ſtill it is ſomething. The Compte de Marſigli found the ſame quantity of water, when taken from the bottom of the Mediterranean, to weigh one ounce three pennyweights 51 grains; whereas from the ſurface it weighed only one ounce three pennyweights 49 grains. He repeated the experiment frequently with nearly the ſame reſult.

The ſea, with reſpect to temperature, may be divided into two regions: The firſt begins at the ſurface of the water, and deſcends as far as the influence of the ſun’s rays; the ſecond reaches from thence to the bottom of the ſea@@. In ſummer the lower region is conſiderably colder than the upper: but it is probable that during winter the very reverſe takes place; at leaſt the Compte de Marſigli found it ſo repeatedly in the Mediterranean. This naturally reſults from the ſituation of the water near the bottom of the ſea. Uninfluenced by the chan­ges in the atmoſphere, it retains always nearly the ſame degree of temperature: and this is conſiderably above congelation; for the lower region of the ſea, at leaſt in the temperate parts of the world, was never known to freeze.@@ Captain Ellis let down a ſea-gage (ſee Gage) in latitude 25⁰ 13' north, and longitude 25⁰ 12' weſt, to take the degrees of temperature and ſaltneſs of the ſea at different depths. It deſcended 5346 feet, which is a mile and eleven fathoms. He found the ſea ſalter and colder in proportion to its depth till the gage had deſcended 3900 feet, when the mercury in the thermo­meter came up at 53; but the water never grew colder, though he let down the gage 2446 feet lower. At the ſurface the thermometer ſtood at 84.

The ſea has three kinds of motion: 1. The firſt is that undulation which is occaſioned by the wind. This motion is entirely confined to the ſurface; the bottom even during the moſt violent ſtorms remains perfectly calm. Mr Boyle has remarked, from the teſtimony of ſeveral divers, that the ſea is affected by the winds only to the depth of ſix feet. It would follow from this, that the height of the waves above the ſurface does not exceed ſix feet; and that this holds in the Mediter­ranean at leaſt, we are informed by the Compte de Mar­ſigli, though he alſo ſometimes obſerved them, during a *very* violent tempeſt, riſe two feet higher. It is af­firmed by Pliny, and ſeveral other ancient writers, that oil calms the waves of the ſea; and that divers were accuſtomed to carry ſome of it for that purpoſe in their mouths. This account was always conſidered by the moderns as a fable, and treated with ſuch contempt, that they did not even deign to put it to the teſt of expeririment, till Dr Franklin accidentally diſcovered its truth. Happening in 1757 to be in the middle of **a** large fleet, he obſerved that the water round one or two veſſels was quite calm and ſmooth, while everywhere elſe it was very much agitated by the winds. He ap­plied to the captain for an explanation of this phenome­non, who replied, that the cooks, he ſuppoſed, had thrown their greaſy water out at the ſcupper-holes, and by that means oiled the ſides of the veſſels in queſtion. This anſwer did not ſatisfy the Doctor at firſt; but re­collecting what Pliny had ſaid on the ſubject, he reſolved at leaſt to try the experiment. He did ſo accord­ingly in 1762, and found that oil actually calmed the waves of the ſea. He repeated the experiment upon lake Clapham: the oil ſpread itſelf with great rapidity upon the ſurface, but did not produce the deſired ef­fect, becauſe, having been thrown in upon the ſide op­poſite to the wind, it was immediately driven to the edge of the water. But upon throwing in a like quan­tity upon the other ſide of the lake, it calmed in an inſtant ſeveral yards of the ſurface; and gradually ſpreading, rendered all that part of the lake, to the extent of at leaſt half an acre, as ſmooth as glaſs. The curious effect produced by this liquid may be accounted for by the repulſion which exiſts between oil and water, and between oil and air, which prevents all immediate con­tact, all rubbing of the one upon the other.

2. The ſecond kind of motion is that continual ten­dency which the whole water in the ſea has towards the weſt. It is greater near the equator than about the poles; and indeed cannot be ſaid to take place at all in the northern hemiſphere beyond the tropic. It begins on the weſt ſide of America, where it is moderate: hence that part of the ocean has been called *Pacific.* As the waters advance weſtward their motion is accele­rated; ſo that, after having traverſed the globe, they ſtrike with great violence on the eaſtern ſhore of Ame­rica. Being ſtopped by that continent, they turn north­ward, and run with conſiderable impetuoſity into the gulph of Mexico; from thence they proceed along the coaſt of North America, till they come to the ſouth ſide of the great bank at Newfoundland, when they turn off, and run down through the Weſtern Iſles. This current is called the *Gulph Stream.* It was firſt accurately deſcribed by Dr Franklin, who remarked alſo, that the water in it having been originally heated in the torrid zone, cools ſo gradually in its paſſage northward, that even the latitude might be found in any part of the ſtream by means of a thermometer.— This motion of the ſea weſtward has never been ex­plained: it ſeems to have ſome connection with the trade-winds and the diurnal revolution of the earth on its axis.

3. The third and moſt remarkable motion of the ſea is the tide, which is a regular ſwell of the ocean once every 12 hours, owing, as Newton has demonſtrated, to the attraction of the moon. In the middle of the ſea the tide ſeldom riſes higher than one or two feet, but on the coaſt it frequently reaches the height of 45

@@@[mu] Boyle de Temperie Regionum Submarinarum.

@@@[mu] Phil. Trans. for 1751, p. 213.