

depth of course, the brine sinking downwards,—must greatly outweigh (I give this as what Petermann would call a gratuitous speculation) the slight expansion caused by the heating of the surface layer. The more restricted arctic basin on the other hand, as was long ago pointed out by Capt. Maury, participates to a certain extent in the characteristics of the Baltic; and I am greatly mistaken if the low specific gravity of the polar sea, the result of the condensation and precipitation of vapour evaporated from the intertropical area, do not fully counter-balance the contraction of the superficial film by arctic cold.

The North Atlantic ocean bears a proportion in depth to the mass of the earth considerably less than that of the paper covering an eighteen-inch globe to that of the globe it covers, while the film heated by direct solar radiation may be represented by its surface coating of varnish, and is not actually thicker than the height of St. Paul's. Physicists seem to find a difficulty in giving us the amount of palpable effect in producing currents in this shell of water, six thousand miles in length by three thousand in width and two miles in thickness, which may be due to causes such as those relied upon by Dr. Carpenter, acting under the peculiar circumstances and to the amount in which we find them in nature; and probably we are not yet in a position to give them sufficient data to enable them to do so. Mr. Croll, a good authority in such matters, has attempted to make some calculations, and comes to the conclusion that none of them are sufficient to overcome the friction of water and to