

A New Experiment of the Noble R. Boyle, concerning an Effect of the Varying Weight of the Atmosphere upon some Bodies in the Water; the Description whereof was presented A. 1671. to the perusal of the Right Honourable the Lord Brouncker; as the Experiment it self was since by the Author's favour shewn to the Publisher.

THough many things have by Ingenious men been already observed, as to the Power and Operations of the Atmosphere's Weight upon Liquors that are expos'd to it in Torricellian Tubes (or other Vessels clos'd at one end, and near the top either empty or unfill'd with any visible Body;) yet men seem not to have much inquired what effects the very *Variation* of this weight of the Atmosphere may have on the Liquors which it presses, in other Vessels than such as Baroscopes and Pumps. And yet when I remember, how much of Air appears by our Engine to be invisibly harbour'd in the Pores not only of Water, but of the Blood, Serum, Urine, Gall, and other Juyces of the Humane Body, and that (as I have elsewhere experimentally shewn) the Pressure of the Atmosphere and the Spring of the Air work upon Liquors and on Bodies immers'd in those Liquors, as well as upon Solid ones immediately expos'd to the Air, I am prone to suspect, that the very Alterations of the Atmosphere in point of Weight may, in some cases, have some not contemptible Operations even upon mens Sickness or Health; as when the ambient Air, for Instance, grows suddenly very much lighter than 'twas before, or than 'twas wont to be, the spirituous and aerial particles, that are plentifully harbour'd in the mass of Blood, will naturally swell that Liquor, and so may distend the greater Vessels, and not a little alter the celerity and manner of the Circulation of the Blood by the Capillary Arteries and Veins. By which alteration that divers Changes may happen in the Body, will not seem improbable to those that know in general, how important a thing the manner of the Circulation of the Blood may be there, though

though as to its particular Effects I leave them to the speculation of Physitians; and shall only add, that to keep this Conjecture of mine (for I propose it as no other) from seeming as groundless as extravagant, I will annex an Experiment that you will not perhaps dislike, just as I find it register'd among some of my loose Papers.

I caused to be blown at the flame of a Lamp three small round Glas-bubbles about the bigness of Hazel-nuts, and furnish'd each of them with a short and slender stem, by whose means they were so nicely poised in water, that a very small change of Weight would make them either emerge, if they but lightly leaned on the bottom of the Vessel, or sink, if they floated on the top of the Water.

This being done at a time when the Atmosphere was of a convenient Weight, (and such a season is not ordinarily difficult to be chosen within some reasonable time to him that wants neither attention nor a good Baroscope) I put them in a wide-wouth'd Glas furnish'd with common Water, and leaving them in a quiet place, where yet they were frequently in my eye, and were suffer'd to continue many weeks (or some months,) I observed, as I expected, that sometimes they would be at the top of the Water, and remain there for divers days, or perhaps Weeks; and sometimes would fall to the Bottom, and after having continued there for some time (longer or shorter) they would again emerge. And though sometimes (especially if I removed the Vessel that contain'd them to a Southern Window,) they would rise to the Top or fall to the Bottom of the Water, according as the Air was hot or cold; yet 'twas not difficult to distinguish those motions from those produced by the varying Gravity of the Atmosphere. For when the Beams of the Sun, or heat of the Ambient Air, by rarifying the Air included in the Bubbles, made that Air drive out some of the Water, and consequently made the whole Bubble (consisting of Glas, Air and Water) somewhat lighter than a bulk of Water equal to it, though the bubble did necessarily swim as long as the included

Air was thus rarified, yet when the absence of the Sun, or any other cause made the Air loose its Adventitious warmth, there would ensue a Condensation of the Air again, and thereupon an Intrusion of more Water (to succeed the Air) into the Glas, and consequently a sinking of the Bubble, and this would commonly happen at night, if it did not happen sooner. But when 'twas upon the account of the Varying Weight of the Atmosphere that the Bubbles either rose or fell, it appear'd by the Baroscope, that the Atmosphere was so heavy or so light, that they ought to do so. Infomuch that I divers times predicted, whether I should find the Mercury in the Baroscope high or low, by observing the situation and posture of the Bubbles; and consulting that Instrument, it verified my Conjectures. And though, whilst the Atmosphere was not too considerably either light or heavy, the Changes of the Air as to Heat or Cold, would (as I was saying) place the Bubbles sometimes at the top and sometimes at the bottom of the Water, within the compass of a day; yet if the Atmosphere were either very heavy or very light, the bubbles would continue at the bottom or at the top of the Water for many daies together in case the Atmosphere did not in all that time change its Gravity. And I remember, that I did, for curiosities sake, when the Quicksilver was high in the Baroscope, put the Glas two or three daies in a South-window about Noon (and for a good while after) and that in Sun-shining weather, and yet even then the Bubbles did not emerge, though it appear'd by a good sealed Weather-glass, which I kept in the same Window, that the ambient Air was much warmer than at other times, when I had observed the Bubbles to keep at the top of the Water.

NB. 1. It being very difficult to poise several Bubbles precisely, as well one as another, I thought it not strange, that all the three Bubbles did not constantly (though for the most part they did) rise and fall together, but sometimes two of them, and now and then (though seldome) one alone would sink or emerge, when the change of the
weight

weight of the Atmosphere was not considerable enough to operate sensibly upon the rest (and of such Instances I have had opportunity to observe one or two within these last three daies:) And therefore 'tis not amiss, to poise a greater number of Bubbles together, that, after tryal made of all, the fittest may be chosen. Which Advertisement will appear the more proper, because of what is to be added in the following Note.

2. I have observed it sometimes to happen, that a Bubble, that floated when 'twas first poised, would after a while subside without any manifest Cause, or if it were made to sink by such a cause, it would continue at the bottom of the Water, though that cause were removed: Which difficult Phenomenon seeming to depend upon a kind of Imbibition made of certain Particles of an Aereal Nature by the Water, the consideration of it belongs to another place, not to this; where it may suffice, that the experiment did sometimes actually answer expectation as that above-related did; wherein my main drift was to shew, that since, as the Atmosphere is heavier or lighter, 'tis capable to work upon Bodies under Water so as to procure their sinking, or their emersion; the Air (though a fluid a thousand times lighter) must lean or press upon the Water it self, by whose intervention it produces these effects; which confirms what I elsewhere teach, that the Atmosphere is incumbent as a heavy Body upon the Terraqueous Globe.

3. Besides the other Circumstances, upon whose account this Experiment may fail of success, the season of the Year, wherein 'tis tryed, may, for ought I know, be considerable. For which reason I shall here add this Advertisement, That I choose, but do not confine my self, to make my Tryals about the beginning of the Spring, as a time wherein notable alterations of the Air, as well as to Weight, as to other things, are the likeliest to be frequent.

So far this Experiment, which upon this occasion is likely to be improv'd unto a kind of Baroscope; which, together with an Hygrocope, may be expected ere long from the same hand.