

derable speculations and researches may arise from such Observations. As for me, I am almost of the opinion, that this Magnetical Diversity comes from the Motion of the Earth. Doubtless, as there is a certain Libration in the Moon, so 'tis not absurd to me, to hold a kind of Libration in the Earth, from the Annual and Diurnal motion of the same. For that the cause of this Declination and Variation of the Load-stone is inherent in the Stone it self, or to be ascribed to Æthereal Corpuscles, is not imaginable by me; nor can I yet devise any cause of those Appearances, except we impute them to the Globe of the Earth, and the Variation of the Meridian. But this subtile Question I leave to deeper Wits to discusse. What you in *England* have lately performed in this matter, I should be very glad to be informed of.

I shall conclude with acquainting you, that I lately received from one, that liveth on the side of the *Baltick* Sea, a piece of *Amber*, which is so soft, that I printed my Seal on it. It is yellowish, as most Amber is; transparent, and burning as other Amber; but its scent stronger, as if it were a kind of glutinous *Bitumen*; and yet it hath been cast up from the Sea this year, and was found among other pieces. His Brother, a very credible person, related at the same time, that he had been master of a small piece of Amber, soft on one side, and very hard on the other, wherein lay buried a Fly.

A Letter of Mr. Joseph Childrey to the Right Reverend Seth Lord Bishop of Sarum, containing some Animadversions upon the Reverend Dr. John Wallis's Hypothesis about the Flux and Reflux of the Sea, publish'd N°. 16. of these Tracts.

MY Lord, The last Summer I acquainted your Lordship, that I had in my mind animadverted somethings upon Dr. *Wallis's* Hypothesis concerning the *Flux* and *Reflux* of the Sea; which I have at length gotten time to put in writing, and here present them inclosed to your Lordship. If upon perusal of them, you shall think them worth transmitting to Dr. *Wallis*, or communicating them to the *R. Society*, I only desire your Lordships and Their favourable censure of my judgment and reasons.

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The Animadversions themselves.

MY intention is not to argue against that part of the Hypothesis, that relates to the *Common Center of Gravity* of the *Earth and Moon*, and the *Diurnal and Menstrual* vicissitudes of the Tydes, the Authors discourse being (in my judgment) so rational and satisfactory as to those, that I cannot see what clear objection can be made against it. But that which I would beg his leave to except against, till better reason convince me, is his opinion concerning the *Annual* vicissitudes, and the true cause thereof, which he supposeth to be quite another thing from the Common center of Gravity, namely the *Inequality* of the *Natural Days*. For I fear he may be mistaken in the time of the *Annual* vicissitudes, which he contendeth to be about *Allballontide* and *Candlemas*: And the reasons of my fear are these;

1. Because, if he dare stand to the general judgment of Seamen, which I conceive is more to be trusted than that of the Inhabitants of *Rumney-marsh*, he will (I dare assure him) find very few of our English Seamen of that mind, who use to say, either that the time of the year signifieth nothing at all, or, if it do, that the highest Tydes of the year seem to happen rather about the *Equinoxes*, than those two other assigned times, when the Natural days are longest and shortest.

2. Whereas he gives an instance or two (pag. 276.) of very high Tydes in the *Thames* in *November* 1660. and 1665; the truth of which we need not question, and of which there are sundry other the like instances in our English Chronicles; I have reason to believe, that those high Tydes proceed from another cause, than he supposeth. For *First*, If that which he supposeth should be the cause, the like high Tydes might be expected every *November*, and (which is more) they should happen as frequently about *February* as about *November*; of which yet he gives not one instance. And (which is yet more, and very considerable) though I have perused throughly that perfect Collection I have of all the high Tydes in the *Thames*, that our *Chronicles* take notice of since the Conquest, I can hardly find one such high Tyde in the *Thames* in *February*, or thereabouts. *Secondly*, Those high Tydes in the *Thames* in *November*, if we dare credit the *London-Watermen*

Watermen, are caused by the coming down of the Land-waters after a very great rain, which being encountered by the Tyde of the flood from the mouth of the *Thames*, cannot but swell to an unusual height : To induce us to believe which, we need only consider, that the latter end of *October*, and beginning of *November* (or rather both those whole Months) are generally the rainiest part of the whole year. Now if the great rains fall so, that the Land-waters come down to the flowing part of the *Thames*, just upon the *Full* or *Change*, when the Spring-Tydes happen, as they did (for example) *Septemb. 30. 1555*, and *October 22. 1629.* (*Stow* and *Hovs* are my Authors,) those Spring-Tydes must be the higher, as proceeding from a double cause. But,

3. (To say no more of the *Thames*, but to consider that and other great Rivers jointly with the Sea,) there is another thing notoriously known by all Seamen to be a cause of High or Low Tydes, which I cannot but say, that I wonder, the Author hath taken so little or no notice of in his Essay, namely the sitting of the *Wind* at such or such a point of compass, and blowing hard. It is the constant saying of all Sea-men in *Kent*, that ever I met with, that the North-west-wind makes the highest Tydes in the *Thames*, *Medway*, and all the coasts about the *South* and *North-forelands*; and likewise on the coast of *Holland* and *Flanders*. And the reason they alledge for it, is, because (say they) that wind doth with equal force blow in the Tyde of Flood at both ends of this Island of *Britain*, that is, from the North-ward between the Coasts of *Scotland*, *Norway*, and *Jutland*; and also from the West-ward by the Coasts of *Cornwall*, *Devonshire*, *Dorsetshire*, &c. up a long the *Sleeve*; and for the same reason they say (and I think truly) that a South-East wind deads and hinders the Tydes in the place before mentioned near the *Forelands*. And agreeably to this, (if the testimony of Youth may be admitted) I very well remember when I was a boy, and lived at home with my Father at *Rochester*, which is near enough to *Chatham*, to observe, how the Tydes run there; that when the Tydes were unusually High, the Wind was always North-west, and the Moon near the Full, or Change. And so confident I am of my memory in this point, that if enquiry be made about *Chatham*, the *Hundred of Hoo*, and the *Isle of Graine*, I believe the Inhabitants will with one voyce say, that they never fear their Low Marshes being
 overflowed

overflowed by the Tyde, but when the wind is at North west, or thereabout, upon the Spring-Tydes. Here at *Weymouth* those able and antient Seamen, I have talked with, tell me, that a SSE. wind makes the greatest Tydes, and that according to the degree of the wind, *cæteris paribus*, the Tydes rise more or less notably; but that they never observe any extraordinary swelling Tydes about *Allhallontide* or *Candlemas*, unless the wind be about SSE. And the reason they give for that winds raising the Tydes there, is (in my opinion) very convincing, if we consider the lying of the Haven in the Map. And for the same reason I suppose the wind from the same point may make the Highest Tydes at *Southampton*; a Westerly wind at *Bristol*, and *Severne*; an Easterly wind at *Hull*; a North-East wind at *Wisbych* and *Lyn*; a Southerly wind upon the opposite Coasts of *England* and *Ireland*, &c. And as confident I am, that if more particular enquiry be made in *Rumney-Marsh*, it will be found, that *Dimchurch-wall* is never in danger of being overflowed or broken by the Tydes, but upon very stormy and tempestuous weather; especially when the Wind either blows right-on upon the Shore, or when it fits in that point, that raiseth the Tydes highest there. Whether the North-west wind (because of the little distance of *Rumney-Marsh* from the *Forelands*) be the raising wind or no, I cannot certainly affirm; but so much I believe, that were it not for the running out of the *Nesse-point* on this side (which makes the Coast a Bay,) and the running out of *Blacknesse-point* in *France* on the other side, *Dimchurch-wall* would be more secure, and need less constant Reparation than it doth. And if we do but consider, that *Allhallontide* and *Candlemas* are no more famous for the longest and shortest Natural days, than they are generally infamous for stormy weather; especially the former season, (wet and windy weather being most concomitant,) we have good ground to attribute high Tydes, at those times of the year, to another cause, than the Author supposeth; and make a more than probable conjecture at the occasion of the mistake. It is true, *March* is very often more stormy than *February* (though seldom so stormy as *October* and *November*) which possibly might occasion that opinion, which some hold, (of which number, *Pliny* is one,) that the highest Tydes are about the *Equinoxes*. And if the thing were found to hit pretty frequently in *March*, men might not be careful

careful to observe the other *Equinox* ; though yet it cannot be denyed, that we have blustering weather many times before *Michaelmas*. In confirmation of all this, that I have said concerning the influence of the wind's being considerable on the Tydes, I shall add these following Collections of my own out of Histories, Chronicles, &c.

1250. *Octob.* 1. (saith *Holinshead*) upon the change of the Moon, was a most dreadful Inundation of the Sea, that did exceeding much hurt to *Holland* beyond Sea, *Holland* in *Lincolnshire*, and the Marsh ground in *Flanders*, and drowned *Winchelsea*. But he tells us withal, that an un-heard of Tempest of wind accompanied it.

1555. *Sept.* 30. (saith *Stow*) was a notable Inundation of the *Thames*; but he saith withal, that it was by occasion of a great Wind, and Rain, that had fallen.

15⁶⁹/₇. *March* 10. I find this Manuscript note in *Latin* in an *Ephemerides* for that year, over against the day; *Septentrionis maxima sevitia: Nivis flocci magni, ingens frigus. Maximè tumescit æstus maris die & nocte; nam excurrerat in agros latè.*

1592. *Sept.* 6. Wednesday (saith *Stow*) the wind being West and by South, as it had been for two days before very boysterous, the *Thames* was made so void of water, by forcing out the Fresh and keeping back the Salt, that men in divers places might go 200 Paces over, and then sling a Stone to Land, &c.

1600. *Decemb.* 8. ft. v. I find this note written in another *Ephemerides* for that year, over against the day, by an unknown person, who (as it seems) was then at *Venice* (where a South-East wind makes the highest Tydes) *Inundatio Venetiis 6. ped. temp. Sirocco.*

1601. (saith *Grimston* in his *Netherland History*) the Sea being forc'd in by a strong N.W. wind, did some mischief to *Ostend*.

1601. *Octob.* 26. ft. n. a Great tempest (saith the same Author) and the wind West and North-west, and the Tyde much higher than usual at *Ostend*.

1602. *Febr.* 23, 24. ft. n. blew a terrible North-west wind, which made the water rise higher than usual at *Ostend*. *Idem.*

1604. *March* 1. n. ft. the wind was very great at West and North west with a furious tempest, the Tyde at *Ostend* rising so high as it had not done in Forty years before. *Idem.*

4. There is yet another thing, which seems to have (at least) some influence on the Tydes, and to make them swell higher than else

else they would do, to wit the *Perigeosts* of the Moon. And this hath been my opinion (taken up first upon the consideration of the Moons coming nearer the Earth) ever since 1652, when living at *Feversham* in *Kent* near the Sea, I found by observing the Tydes, (as often as I had leisure,) that there might be some truth in my Conjecture; and therefore in a little Pamphlet, published in 1653. by the name of *Syzygiasticon instauratum*, I desired, that others would observe that year, whether the Spring-Tydes after those Fulls and Changes, when the Moon was in *Perigæo* (the wind together considered) were not higher than usual. And since that time I have found several high Tydes and Inundations (though I must not say *all*,) to happen upon the Moons being in, or very near her *Perigæum*. For Example,

1. That famous Inundation, mentioned before out of *Holinshed*, 1250. *Octob.* 1. was, when the Moon was in *Perigæo*, as appears by Calculation.

2. 1530. *Novemb.* 5. That Inundation on which was made the Distick,

*Anno ter deno post sesquimille, Novembris
Quintâ, stat salis Zelandia tota sub undis;*

was, when the Moon was in *Perigæo*.

3. *Jan.* 13. 155½. the Sea (saith *Michell* in his Chronicle) brake in at *Sandwich*, and overflowed all the Marshes thereabout, and drowned much Cattel: the Moon in *Perigæo*.

4. 1570. *Novemb.* 1. was a dreadful Flood at *Antwerp*, and on all the Coasts of *Holland*, that made infinite spoyl: the Moon in *Perigæo*.

5. 1600. *Decemb.* 8. above mentioned: the Moon in *Perigæo*.

6. 160½. *Jan.* 20. was a great Inundation in *Severne*, mentioned in *Howes's* Chronicle, that did much hurt in *Somersetshire*, and *Glocestershire*, &c. the Moon in *Perigæo*.

7. 1555. *Septemb.* 30. (forgotten in its due place:) the Moon was in *Perigæo*.

8. 1643. *Jan.* 23. ft. n. (saith a little *Low-Dutch* Chronicle that I have) was a terrible high Water-flood in *Friesland*, &c. whereby much hurt was done to the Dykes; and at *Gaes* by *Haerlingen* the Dead bodies streamed out of the Earth: the Moon in *Perigæo*.

9. 1651. *Feb.* 23. ft. n. (saith the same Chronicle) was St. *Peter's* High flood, whereby much hurt was done to the Dykes in *Friesland*,

Friezland, Embderland, and elsewhere, and not far from *Dockum* by *Ondt-woudumer-zijl* is a breach of 42 roods long broken in the Dyke : the Moon in *Perigæo*.

10. *August 2, 1657. ft. v. at Feversham* (where I then lived) was a very high Spring-Tyde, and yet the wind was at South-East; which deads the Tydes there : the Moon in *Perigæo*.

11. *August 22. 1658. ft. v. at Feversham* was a very high Tyde in the After-noon, though the wind was Southerly, and blew very stiff, which the Seamen there wondered at : the Moon in *Perigæo*.

12. 1661. Upon *Michaelmas* day was a great overflowing of the *Severn*, that it drowned the low grounds lying by it. I lived then in *Glocester-shire*, and immediately as soon as I heard of it, I noted it down in my memorandums : the Moon in *Perigæo*.

13. The Scheme of the weather printed in the History of the *R. Society* tells us, that *May 24. 1663.* was a very great Tyde at *London*. But it tells us withall that the same day the Moon was in *Perigæo*.

14. *Sept. 1. 1669.* Here at *Weymouth*, I observed my self a very high Tyde; and so did several Seamen in that Town, who wondered at it, the weather being very calm, and that little wind that was being at North-East, which uses to contribute nothing at all to the Tydes in that haven : the Moon in *Perigæo*.

Further, that which inclines mee to believe, that the *Perigæostis* of the Moon is of some concernment in this matter, is, because it is a Maxim amongst our *Kentish* Seamen, that they never have two running Spring-Tydes (as they call them) together, but that the next Spring tyde, after a high running Spring, is proportionably weak and slack; which, if true, is very correspondent to my opinion, because if the Moon be in *Perigæo* at this Spring-tyde, she will be in *Apogæo* at the next.

But I conceive the best touch-stone to prove the soundness of my opinion (which I confess I never had the opportunity to do yet,) is, to have it observed, whether those Neap-tydes be not apparently higher (*consideratis considerandis*) that happen at the Moons being in *Perigæo* either at the first or last quarter : Because it is a received and demonstrable truth in Astronomy, that the Moon being in *Perigæo* at either quarter comes then nearer the Earth, than when it is in *Perigæo* at the Change or Full, And I could

wish for the further clearing of this matter, that observation were made at *Bristol* (because there is the most considerable Flux and Reflux of any Port of England,) Whether this year 1670. the Tydes be not higher (*consideratis*, &c.) when the ☽ passeth ♋. ♌. and ♍, than when she passeth through the opposite signs ♏. ♐. and ♑; and particularly whether the Spring Tydes be not sensibly higher after the *Change*, than after the *Full* in *February*, *March*, and *April*; and higher after the *Full* then after the *Change* in *August*, *September*, and *October*; and also, Whether the Neap-tides in *May* and *June* rise not apparently higher than expected. I am promised, the observation shall be made here at *Weymouth* for this whole year round; from whence I have already received this account, that this present *February* 1670. the Spring-Tydes ran very high after the *Change*, though the weather were pretty calm, and that wind that was not very favourable to the Tydes, and that the Spring-Tydes after the *Full* were very low, and weak, which is exactly according to my conjecture.

Dr. Wallis's Answer to the foregoing Animadversions, directed in a Letter to the Publisher, March 19. 1670.

SIR, Yours with the inclosed Animadversions of M. *Childrey* on my Hypothesis of *Tydes*, came so late to hand on Thursday last (when the Post was almost ready to be gone) that I had not time, by that Post, to give you an account of them. And it is not much, I need to say now; for I do not find, that he and I are like much to disagree.

That the *Winds* have a great influence on the Tydes of particular Coasts and Havens, according as they are more or less stiff or slack, and blow from this or that part, I do not at all question; but did alwayes take for granted, as generally received, and upon good grounds. And the like I say of *Land waters*; which (though as to the Sea they signify not much in this point) are, as to In-land Rivers, very considerable; especially as to Inundations upon rising of the Water: Which is rather by Checking than Promoting the Tydes. For certainly, these Land-waters, meeting the Tyde of Flood, do hinder it from coming so far up the River as otherwise it would; and consequently, if, notwithstanding such Land-floods,