

PHILOSOPHICAL TRANSACTIONS.

Munday, June 4. 1666.

The Contents.

Certain Problems touching some Points of Navigation. Of a new Contrivance of Wheel-Barometer, much easier to be prepar'd, than others. An account of Four Suns which lately appear'd in France; and of two, unusually posited, Rainbows, seen in the same Kingdom. A Relation of an Accident, by Thunder and Lightning, in Oxford. An Experiment, to examine, what Figure or Celerity of Motion begetteth or increaseth Light and Flame. Some Considerations touching a Letter in the Journal des Scavans of May 24. 1666.

Certain Problems Touching some Points of Navigation.



These Problems are presented by the Learned and Industrious *Nicolaus Mercator*, for the advancing of that Excellent and Beneficial Science, *Navigation*, as follows:

The line of *Artificial Tangents*, or the *Logarithmical Tangent-line*, beginning at 45 deg. and taking every half degree for a whole one, is found to agree pretty near with the *Meridian-line* of the *Sea-Charte*; they both growing, as it were, after the same Proportion. But the Table of *Meridional* degrees being calculated only to every *Sexagesimal* minute of a degree, shews some small difference from the said *Logarithmical Tangent-line*. Hence it may be doubted, whether that difference do not arise from that little error, which is committed by calculating the Table of *Meridional* degrees only to every minute.

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Mr. *Oughtred* in the VI. *Chap.* of his *Navigation*, annexed to the Book, entituled, *The Circles of Proportion, and the Horizontal Instrument*, &c. mentions an Artifice, by himself discover'd, by which it may be effected, that the small Parts of the *Meridian* be not *one* minute (which on the face of the *Earth* answers to above an *English* Mile) but the hundred-thousandth, or, if need be, the millioneth part of a minute, scarce exceeding one fifteenth part of an Inch: Which thing, *he saith*, he is able to perform in *Tables* unto the *Radius* 10000000; yet nothing at all differing either in their form or manner of working from those that are now commonly in use.

But which way this is to be done, this *Author* hath not made known to the Publick. And, though such *Tables* unto the *Radius* 10000000, had been brought to light, yet would they not be sufficient to prove the identity or sameness of the said two Lines, as to continue the comparison between them as far, as the one of them, *videl.* the *Logarithmicall Tangent-line*, is already calculated, that is, to Ten places, besides the *Charaëtoristick*.

Now therefore, if a certain Rule could be produced, by which the Agreement or Disagreement of the said two Lines might be shew'd, not only to that Extent of places, to which that *Tangent Line* is already calculated, but also to as many more, as the same may be yet further extended unto, in *infinitum usque*; surely that rule would not only save us the labour of making *Tables* unto the *Radius* 10000000; but also the *Helix* or *Spiral Line* of the Ships Course would be reduced to a more precise exactness, than ever was pretended by Him: and this most Noble and Useful Science (as He justly calls it) which is the Bond of most disjunct Countries, and the Consociation of Nations farthest remote, would attain its full lustre and perfection.

Besides, that the same Rule would also discover a far easier way of making *Logarithmes*, than ever was practis'd or known; and therefore might serve, when ever there should be occasion, to extend the *Logarithmes* beyond that number of places, that is already extant.

Moreover such a rule would enable men to draw the *Meridian* line *geometrically*, that is, without *Tables* or *Scales*: which indeed might

might also be done, by setting of the *Secants* of every whole or half degree, if there were not this Inconveniency in it (which is not in my Rule :) That a Line composed of so many small parts, would be subject to many errors, especially in a small compass.

The same Rule also will serve, to find the Course and Distance between two Places assigned, as far, as practice shall require it; and that, without any Table of *Meridional* parts, and yet with as much ease and exactness.

And seeing all these things do depend on the solution of this Question, *Whether the Artificial Tangent-line be the true Meridian-line?* It is therefore, that I undertake, by God's assistance, to resolve the said Question. And to let the world know the readiness and confidence, I have to make good this undertaking, I am willing to lay a *Wager* against any one or more persons that have a mind to engage, for so much as *another Invention* of mine (which is of less subtlety, but of far greater benefit to the publick) may be worth to the Inventor.

For, the great advantage, that all Merchants, Mariners, and consequently the Common-wealth, may receive from this *other Invention*, is, in my judgment, highly valuable; seeing it will oftentimes make a ship sail, though, according to the common way of sailing, the wind be quite contrary, and yet as near to the place intended, as if the wind had been favourable: Or, if you will, it will enable one to gain something in the intended way, whether the wind be good or no (except only when you go directly South or North) but the advantage will be most, where there is most need of it, that is, when the Wind is contrary: So that one may very often gain a fifth, fourth, third part, or more of the intended voyage; according as it is longer or shorter, *viz.* always more in a longer Voyage, where the gain is more considerable, and more welcome; not only by saving Time, but also Victuals, Water, Fuel, Mens health, and so much Room in the ship.

All this, which is here pretended, the Proposer is to make good by the Verdict of some able Men, who also may give a guess, what this latter Invention may be worth to the owner: And for so much, and no more, he will stand engaged against a-

ny one or more Persons, that he will and shall resolve the *Question* above-mention'd, *viz. Whether the Artificial Tangent-line be the true Meridian-line, yea or no?* And if he do not, that then he will loose, and transport to the other Party the whole benefit of the last mentioned invention. But if, on the contrary, he do prove or disprove the Identity of the said two lines, to the Judgment of some able *Mathematicians*, That then so much money be paid him by the other Party, as the said Invention was valued.

And, whereas there are often Wagers laid about things that concern the Engagers little or nothing; 'tis thought, that it would concern all Merchants, Mariners, and all Lovers of the common good, rather to lay wagers against one another about Things of this nature, where the Gainer doth gain as well, as if he had laid his wager about something else, and the Looser hath so far the benefit as well as the Gaine, That he seeth thereby promoted the thing, that concerns them both alike.

Now therefore, to the end, that the Looser may have his benefit by it, as well as the Gainer, it would not be amiss, that the condition were made thus, that the latter should grant the moiety of his gain to the Proposer; that thereby he might be enabled to bring to light both those, and some other useful inventions, for the Service of Mankind. And to manifest, that it is not for his own interest only, that the *Proposer* mentions this; he is willing to impart from that moiety, so received, the full moiety again to any other person within his Majesty's Dominions, who shall first of all give notice of his Undertaking to prove or disprove the said Identity, and perform it accordingly within the space of two Months, to be computed from the present Date. Those that have a mind to engage, may repair to the Printers of these *Traacts*, where they may know further.

A new Contrivance of Wheel-Barometer, much more easy to be prepared, than that, which is described in the Micrography; imparted by the Author of that Book.

This is only an easy way of applying an *Index* to any *Common Barascope*, whether the Glass be only a Single Cane, or have a round Bolt-head at the top. And by the means thereof, the
Variation