

Transcriber's Notes:

All apparent printer's errors retained. Variation in punctuation are as in the original, but missing full stops at end of paragraphs have been supplied. There are inconsistencies in the use of italics, spacing of words and use of full stop after 'AXIOME', abbreviations etc. All are retained to match text. There is a great variation in spelling including multiple spellings of the same word, all spelling has been retained to match text. There are several instances of obviously missing letters or inverted n & u. These have been changed or obvious letters replaced, with the changes surrounded by {}.

All instances are detailed at the end of the text. It should also be noted that in the original text there is a missing line at the end of page 24 in original text.

There are a number of instances in the original text where 'that' is immediately followed by a second 'that' in the sentence. These could be potential printer's errors or, since several of them make sense, part of the author's style. They have been left in the text as they appear in the original text.

The images have been retouched to clean up the diagrams and to improve readability of lettering where possible.

A

DISCOURSE

P R E S E N T E D

T O T H E M O S T S E R E N E

Don Cosimo II.

GREAT DUKE

O F

TUSCANY,

C O N C E R N I N G

The *N A T A T I O N* of B O D I E S Vpon,

And *S U B M E R S I O N* In,

T H E

WATER.

By *G a l i l e u s G a l i l e i*: Philosopher and

Mathematician unto His most Serene Highnesse.

Englised from the Second Edition of the *I t a l i a n* ,

compared with the Manuscript Copies, and reduced

into P R O P O S I T I O N S :
By *T H O M A S S A L U S B U R Y*, Esq;

L O N D O N :
Printed by W i l l i a m L e y b o u r n :
M D C L X I I I .

[Pg 1]

A D I S C O V R S E

Presented to the Most Serene D o n C o s i m o II.

Great Duke of *T U S C A N Y* :

C O N C E R N I N G

The Natation of B O D I E S Upon, or Submersion

In, the W A T E R .

Onsidering (Most Serene Prince) that the publishing this present Treatise, of so different an Argument from that which many expect, and which according to the intentions I proposed in my * Astronomicall

His Nuncio Siderio.

Adviso, I should before this time have put forth, might peradventure make some thinke, either that I had wholly relinquished my farther employment about the new Celestiall Observations, or that, at least, I

handled them very remissely; I have judged fit to render an account, aswell of my deferring that, as of my writing, and publishing this treatise.

As to the first, the last discoveries of *Saturn* to be tricorporeall, and of the mutations of Figure in *Venus*, like to those that are seen in the Moon, together with the Consequents depending thereupon, have not so much occasioned the demur, as the investigation of the times of the Conversions of each of the Four Medicean Planets about *Jupiter*, which I lighted upon in *April* the year past, 1611, at my being in *Rome*; where, in the end, I ascertained my selfe, that the first and neerest to *Jupiter*, moved about 8 *gr.* & 29 *m.* of its Sphere in an houre, makeing its whole revolution in one naturall day, and 18 hours, and almost an halfe. The second moves in its Orbe 14 *gr.* 13 *min.* or very neer, in an hour, and its compleat conversion is consummate in 3 dayes, 13 hours, and one third, or thereabouts. The third passeth in an hour, 2 *gr.* 6 *min.* little more or less of its Circle, and measures it all in 7 dayes, 4 hours, or very neer. The fourth, and more remote than the rest, goes in one houre, 0 *gr.* 54 *min.* and almost an halfe of its Sphere, and finisheth it all in 16 dayes, and very neer 18 hours. But because the excessive velocity of their returns or restitutions, requires a most scrupulous precisenesse to calculate their places, in

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times past and future, especially if the time be for many Moneths or Years; I am therefore forced, with other Observations, and more exact than the former, and in times more remote from one another, to correct the Tables of such Motions, and limit them even to the shortest moment: for such exactnesse my first Observations suffice not; not only in regard of the short intervals of Time, but because I had not as then found out a way to measure the distances between the said Planets by any Instrument: I Observed such Intervals with simple relation to the Diameter of the Body of *Jupiter*; taken, as we have said, by the eye, the which, though they admit not errors of above a Minute, yet they suffice not for the determination of the exact greatness of the Spheres of those Stars. But now that I have hit upon a way of taking such measures without failing, scarce in a very few Seconds, I will continue the observation to the very occultation of *JUPITER*, which shall serve to bring us to the perfect knowledge of the Motions, and Magnitudes of the Orbes of the said Planets,

together

The Authors Observations of the Solar Spots

also with some other consequences thence arising. I adde to these things the observation of some obscure Spots, which are discovered in the Solar Body, which changing, position in that, propounds to our consideration a great argument either that the Sun revolves in it selfe, or that perhaps other Starrs, in like manner as *Venus* and *Mercury*, revolve about it, invisible in other times, by reason of their small digressions, lesse than that of *Mercury*, and only visible when they interpose between the Sun and our eye, or else hint the truth of both this and that; the certainty of which things ought not to be contemned, nor omitted.

Continuall observation hath at last assured me that these Spots are matters contiguous to the Body of the Sun, there continually produced in great number, and afterwards dissolved, some in a shorter, some in a longer time, and to be by the Conversion or Revolution of the Sun in it selfe, which in a Lunar Moneth, or thereabouts, finisheth its Period, caried about in a Circle, an accident great of it selfe, and greater for its Consequences.

The occasion inducing the Author to write this Treatise.

As to the other particular in the next place * Many causes have moved me to write the present Tract, the subject whereof, is the Dispute which I held some dayes since, with some learned men of this City, about which, as your Highnesse knows, have followed many Discourses: The principall of which Causes hath been the Intimation of your Highnesse, having commended to me Writing, as a singular means to make true known from false, reall from apparent Reasons, farr better than by Disputing vocally, where the one or the other, or very often

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both the Disputants, through too greate heate, or exalting of the voyce, either are not understood, or else being transported by ostentation of not yeilding to one another, farr from the first Proposition, with the novelty, of the various Proposals, confound both themselves and their Auditors.

Moreover, it seemed to me convenient to informe your Highnesse of

all the sequell, concerning the Controversie of which I treat, as it hath been advertised often already by others: and because the Doctrine which I follow, in the discussion of the point in hand, is different from that of *Aristotle*; and interferes with his Principles, I have considered that against the Authority of that most famous Man, which amongst many makes all suspected that comes not from the Schooles of the Peripateticks, its farr better to give ones Reasons by the Pen than by word of mouth, and therefore I resolved to write the present discourse: in which yet I hope to demonstrate that it was not out of capritiousnesse, or for that I had not read or understood *Aristotle*, that I sometimes swerve from his opinion, but because severall Reasons perswade me to it, and the same *Aristotle* hath taught me to fix my judgment on that which is grounded upon Reason, and not on the bare

Aristotle prefers Reason to the Authority of an Author.

Authority of the Master; and it is most certaine according to the sentence of *Alcinoos*, that philosophating should be free. Nor is the resolution of our Question in my judgment without some benefit to the

The benefit of this Argument.

Universall, forasmuch as treating whether the figure of Solids operates, or not, in their going, or not going to the bottome in Water, in occurrences of building Bridges or other Fabricks on the Water, which happen commonly in affairs of grand import, it may be of great availe to know the truth.

I say therefore, that being the last Summer in company with certain Learned men, it was said in the argumentation; That Condensation was

Condensation the Propriety of Cold, according to the Peripateticks.

the propriety of Cold, and there was alledged for instance, the example of Ice: now I at that time said, that, in my judgment, the Ice

Ice rather water rarified, than condensed, and why:

should be rather Water rarified than condensed, and my reason was, because Condensation begets diminution of Mass, and augmentation of gravity, and Rarification causeth greater Lightness, and augmentarion of Masse: and Water in freezing, encreaseth in Masse,

and the Ice made thereby is lighter than the Water on which it swimmeth.

What I say, is manifest, because, the medium subtracting from the whole Gravity of Sollids the weight of such another Masse of the

In lib: 1. of Natation of Bodies Prop. 7.

*said Medium; as Archimedes proves in his * First Booke De Insidentibus Humido; when ever the Masse of the said Solid encreaseth by Distraction, the more shall the Medium detract from its entire Gravity; and lesse, when by Compression it shall be condensed and reduced to a lesse Masse.*

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Figure operates not in the Natation of Sollids.

It was answered me, tha{t} that proceeded not from the greater Levity, but from the Figure, large and flat, which not being able to penetrate the Resistance of the Water, is the cause that it submergeth not. I replied, that any piece of Ice, of whatsoever Figure, swims upon the Water, a manifest signe, that its being never so flat and broad, hath not any part in its floating: and added, that it was a manifest prooffe hereof to see a piece of Ice of very broad Figure being thrust to the botome of the Water, suddenly return to flote atoppe, which had it been more grave, and had its swimming proceeded from its Forme, unable to penetrate the Resistance of the *Medium*, that would be altogether impossible; I concluded therefore, that the Figure was in sort a Cause of the Natation or Submersion of Bodies, but the greater or lesse Gravity in respect of the Water: and therefore all Bodyes heavier than it of what Figure soever they be, indifferently go to the bottome, and the lighter, though of any figure, float indifferently on the top: and I suppose that those which hold otherwise, were induced to that believe, by seeing how that diversity of Formes or Figures, greatly altereth the Velocity, and Tardity of Motion; so that Bodies of Figure broad and thin, descend far more leasurly into the Water, than those of a more compacted Figure, though both made of the same Matter: by which some might be induced to believe that the Dilatation of the Figure might reduce it to such amplenesse that it should not only retard but wholly impede and take away the Motion, which I hold to be false. Upon this Conclusion, in many dayes discourse, was spoken much, and many things, and divers Experiments produced, of which your Highnesse heard, and

saw some, and in this discourse shall have all that which hath been produced against my Assertion, and what hath been suggested to my thoughts on this matter, and for confirmation of my Conclusion: which if it shall suffice to remove that (as I esteem hitherto false) Opinion, I shall thinke I have not unprofitably spent my paynes and time. and although that come not to passe, yet ought I to promise another benefit to my selfe, namely, of attaining the knowledge of the truth, by hearing my Fallacyes confuted, and true demonstrations produced by those of the contrary opinion.

And to proceed with the greatest plainness and perspicuity that I can possible, it is, I conceive, necessary, first of all to declare what is the true, intrinsecall, and totall Cause, of the ascending of some Sollid Bodyes in the Water, and therein floating; or on the contrary, of their sinking and so much the rather in asmuch as I cannot satisfie myselfe in that which *Aristotle* hath left written on this Subject.

The cause of the Natation & submersion of Solids in the Water.

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I say then the Cause why some Sollid Bodyes descend to the Bottom of Water, is the excesse of their Gravity, above the Gravity of the Water; and on the contrary, the excess of the Waters Gravity above the Gravity of those, is the Cause that others do not descend, rather that they rise from the Bottom, and ascend to the Surface. This was subtilly demonstrated by *Archimedes* in his Book Of the N a t a t i o n of B o d i e s : Conferred afterwards by a very grave Author, but, if I erre not invisibly, as below for defence of him, I shall endeavour to prove.

I, with a different Method, and by other meanes, will endeavour to demonstrate the same, reducing the Causes of such Effects to more intrinsecall and immediate Principles, in which also are discovered the Causes of some admirable and almost incredible Accidents, as that would be, that a very litle quantity of Water, should be able, with its small weight, to raise and sustain a Solid Body, an hundred or a thousand times heavier than it.

And because demonstrative Order so requires, I shall define certain Termes, and afterwards explain some Propositions, of which, as of things true and obvious, I may make use of to my present purpose.

DEFINITION I.

I then call equally Grave in specie, those Matters of which equal Masses weigh equally.

As if for example, two Balls, one of Wax, and the other of some Wood of equal Masse, were also equal in Weight, we say, that such Wood, and the Wax are *in specie* equally grave.

DEFINITION II.

But equally grave in Absolute Gravity, we call two Sollids, weighing equally, though of Mass they be unequall.

As for example, a Mass of Lead, and another of Wood, that weigh each ten pounds, I call equal in Absolute Gravity, though the Mass of the Wood be much greater then that of the Lead.

And, consequently, less Grave in specie.

DEFINITION III.

I call a Matter more Grave in specie than another, of which a Mass, equall to a Mass of the other, shall weigh more.

And so I say, that Lead is more grave *in specie* than Tinn, because if you take of them two equal Masses, that of the Lead weigheth more. [Pg 6]

DEFINITION IV.

But I call that Body more grave absolutely than this, if that weigh more than this, without any respect had to the Masses.

And thus a great piece of Wood is said to weigh more than a little lump of Lead, though the Lead be *in specie* more heavy than the Wood. And the same is to be understood of the less grave *in specie*, and the less grave absolutely.

These Termes defined, I take from the Mechanicks two Principles: the first is, that

A X I O M E . I .

Weights absolutely equall, moved with equall Velocity, are of equall Force and Moment in their operations.

D E F I N I T I O N V .

Moment, amongst Mechanicians, signifieth that Vertue, that Force, or that Efficacy, with which the Mover moves, and the Moveable resists.

Which Vertue dependes not only on the simple Gravity, but on the Velocity of the Motion, and on the diverse Inclinations of the Spaces along which the Motion is made: For a descending Weight makes a greater Impetus in a Space much declining, than in one less declining; and in summe, what ever is the occasion of such Vertue, it ever retaines the name of Moment; nor in my Judgement, is this sence new in our Idiome, for, if I mistake not, I think we often say; This is a weighty businesse, but the other is of small moment: and we consider lighter matters and let pass those of Moment; a Metaphor, I suppose, taken from the Mechanicks.

As for example, two weights equall in absolute Gravity, being put into a Ballance of equall Arms, they stand in *Equilibrium*, neither one going down, nor the other up: because the equality of the Distances of both, from the Centre on which the Ballance is supported, and about which it moves, causeth that those weights, the said Ballance moving, shall in the same Time move equall Spaces, that is, shall move with equall Velocity, so that there is no reason for which

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this Weight should descend more than that, or that more than this; and therefore they make an *Equilibrium*, and their Moments continue of semblable and equall Vertue.

The second Principle is; That

A X I O M E II .

The Moment and Force of the Gravity, is encreased by the Velocity of the Motion.

So that Weights absolutely equall, but conjoynd with Velocity unequal, are of Force, Moment and Vertue unequal: and the more potent, the more swift, according to the proportion of the Velocity of the one, to the Velocity of the other. Of this we have a very pertinent example in the Balance or Stiliard of unequal Arms, at which Weights absolutely equall being suspended, they do not weigh down, and gravitate equally, but that which is at a greater distance from the Centre, about which the Beam moves, descends, raising the other, and the Motion of this which ascends is slow, and the other swift: and such is the Force and Vertue, which from the Velocity of the Mover, is conferred on the Moveable, which receives it, that it can exquisitely compensate, as much more Weight added to the other slower Moveable: so that if of the Arms of the Balance, one were ten times as long as the other, whereupon in the Beames moving about the Centre, the end of that would go ten times as far as the end of this, a Weight suspended at the greater distance, may sustain and poyse another ten times more grave absolutely than it: and that because the Stiliard moving, the lesser Weight shall move ten times faster than the bigger. It ought alwayes therefore to be understood, that Motions are according to the same Inclinations, namely, that if one of the Moveables move perpendicularly to the Horizon, then the other makes its Motion by the like Perpendicular; and if the Motion of one were to be made Horizontall; that then the other is made along the same Horizontall plain: and in summe, alwayes both in like Inclinations. This proportion between the Gravity and Velocity is found in all Mechanicall Instruments: and is considered by *Aristotle*, as a Principle in his *Mechanicall Questions*; whereupon we also may take it for a true Assumption, That

A X I O M E III .

Weights absolutely unequal, do alternately counterpoise and become of equal Moments, as oft as their Gravities, with contrary proportion, answer to the Velocity of their

Motions.

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That is to say, that by how much the one is less grave than the other, by so much is it in a constitution of moving more swiftly than that.

Having prefatically explicated these things, we may begin to enquire, what Bodies those are which totally submerge in Water, and go to the Bottom, and which those that by constraint float on the top, so that being thrust by violence under Water, they return to swim, with one part of their Mass visible above the Surface of the Water: and this we will do by considering the respective operation of the said Solids, and of Water: Which operation followes the Submersion and sinking; and

How the submersion of Solids in the Water, is effected.

this it is, That in the Submersion that the Solid maketh, being depressed downwards by its proper Gravity, it comes to drive away the water from the place where it successively subenters, and the water repulsed riseth and ascends above its first levell, to which Ascent on the other side it, as being a grave Body of its own nature, resists: And because the descending Solid more and more immersing, greater and greater quantity of Water ascends, till the whole Sollid be submerged; its necessary to compare the Moments of the Resistance of the water to Ascension, with the Moments of the pressive Gravity of the Solid: And if the Moments of the Resistance of the water, shall equalize the

What Solids shall float on the Water.

Moments of the Solid, before its total Immersion; in this case doubtless there shall be made an *Equilibrium*, nor shall the Body sink any farther. But if the Moment of the Solid, shall alwayes exceed the Moments wherewith the repulsed water successively makes

What Solids shall sinke to the botome.

Resistance, that Solid shall not only wholly submerge under water, but shall descend to the Bottom. But if, lastly, in the instant of total Submersion, the equality shall be made between the Moments of the

What Solids shall rest in all places of the Water.

prement Solid, and the resisting Water; then shall rest, ensue, and the said Solid shall be able to rest indifferently, in whatsoever part of the water. By this time is manifest the necessity of comparing the

The Gravities of the Water and Solid must be compared in all Problems, of Natation of Bodies.

Gravity of the water, and of the Solid; and this comparison might at first sight seem sufficient to conclude and determine which are the Solids that float a-top, and which those that sink to the Bottom in the water, asserting that those shall float which are lesse grave *in specie* than the water, and those submerge, which are *in specie* more grave. For it seems in appearance, that the Solid in sinking continually, raiseth so much Water in Mass, as answers to the parts of its own Bulk submerged: whereupon it is impossible, that a Solid less grave *in specie*, than water, should wholly sink, as being unable to raise a weight greater than its own, and such would a Mass of water equall to its own Mass be. And likewise it seems necessary, that the graver Solids do go to the Bottom, as being of a Force more than sufficient for the raising a Masse of water, equall to its own, though inferiour in weight. Nevertheless the business succeeds otherwise: and

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though the Conclusions are true, yet are the Causes thus assigned deficient, nor is it true, that the Solid in submerging, raiseth and repulseth Masses of Water, equall to the parts of it self submerged; but the Water repulsed, is alwayes less than the parts of the Solid

The water repelled is ever less than the parts of the Solid submerged.

submerged: and so much the more by how much the Vessell in which the Water is contained is narrower: in such manner that it hinders not, but that a Solid may submerge all under Water, without raising so much Water in Mass, as would equall the tenth or twentieth part of its own Bulk: like as on the contrary, a very small quantity of Water, may

A small quantity of water, may float a very great Solid Mass.

raise a very great Solid Mass, though such Solid should weigh absolutely a hundred times as much, or more, than the said Water, if so be that the Matter of that same Solid be *in specie* less grave than the Water. And thus a great Beam, as suppose of a 1000 weight, may be raised and born afloat by Water, which weighs not 50: and this

happens when the Moment of the Water is compensated by the Velocity of its Motion.

But because such things, propounded thus in abstract, are somewhat difficult to be comprehended, it would be good to demonstrate them by particular examples; and for facility of demonstration, we will suppose the Vessels in which we are to put the Water, and place the Solids, to be environ'd and included with sides erected perpendicular to the Plane of the Horizon, and the Solid that is to be put into such vessell to be either a streight Cylinder, or else an upright Prisme.

The which proposed and declared, I proceed to demonstrate the truth of what hath been hinted, forming the ensuing Theoreme.

T H E O R E M E I .

The Proportion of the water raised to the Solid submerged.

The Mass of the Water which ascends in the submerging of a Solid, Prisme or Cylinder, or that abaseth in taking it out, is less than the Mass of the said Solid, so depressed or advanced: and hath to it the same proportion, that the Surface of the Water circumfusing the Solid, hath to the same circumfused Surface, together with the Base of the Solid.

Let the Vessell be A B C D, and in it the Water raised up to the Levell E F G, before the Solid Prisme H I K be therein immersed; but after that it is depressed under Water, let the Water be raised as high as the Levell L M, the Solid H I K shall then be all under Water, and the Mass of the elevated Water shall be L G, which is less than

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the Masse of the Solid depressed, namely of H I K, being equall to the only part E I K, which is contained under the first Levell E F G. Which is manifest, because if the Solid H I K be taken out, the Water I G shall retur into the place occupied by the Mass E I K, where it was continuate before the submersion of the Prisme. And the Mass L G being equall to the Mass E K: adde thereto the Mass E N, and it shall be the whole Mass E M, composed of the parts of the Prisme E N,

and of the Water N F, equall to the whole Solid H I K: And, therefore, the Mass L G shall have the same proportion to E M, as to the Mass H I K: But the Mass L G hath the same proportion to the Mass E M, as the Surface L M hath to the Surface M H: Therefore it is manifest, that the Mass of Water repulsed L G, is in proportion to the Mass of the Solid submerged H I K; as the Surface L M, namely, that of the Water ambient about the Solid, to the whole Surface H M, compounded of the said ambient water, and the Base of the Prisme H N. But if we suppose the first Levell of the Water the according to the Surface H M, and the Prisme allready submerged H I K; and after to be taken out and raised to E A O, and the Water to be faln from the first Levell H L M as low as E F G; It is manifest, that the Prisme E A O being the same with H I K, its superiour part H O, shall be equall to the inferiour E I K: and remove the common part E N, and, consequently, the Mass of the Water L G is equall to the Mass H O; and, therefore, less than the Solid, which is without the Water, namely, the whole Prisme E A O, to which likewise, the said Mass of Water abated L G, hath the same proportion, that the Surface of the Waters circumfused L M hath to the same circumfused Surface, together with the Base of the Prisme A O: which hath the same demonstration with the former case above.

And from hence is inferred, that the Mass of the Water, that riseth in the immersion of the Solid, or that ebbeth in elevating it, is not equall to all the Mass of the Solid, which is submerged or elevated, but to that part only, which in the immersion is under the first Levell of the Water, and in the elevation remaines above the first Levell: Which is that which was to be demonstrated. We will now pursue the things that remain.

And first we will demonstrate that,

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T H E O R E M E I I .

The proportion of the water abated, to the Solid raised.

When in one of the above said Vessels, of what ever breadth, whether wide or narrow, there is placed such a Prisme or Cylinder, environ'd with Water, if we elevate that Solid perpendicularly, the Water circumfused shall abate,

and the Abatement of the Water, shall have the same proportion to the Elevation of the Prisme, as one of the Bases of the Prisme, hath to the Surface of the Water Circumfused.

Imagine in the Vessell, as is aforesaid, the Prisme A C D B to be placed, and in the rest of the Space the Water to be diffused as far as the Levell E A: and raising the Solid, let it be transferred to G M, and let the Water be abased from E A to N O: I say, that the descent of the Water, measured by the Line A O, hath the same proportion to the rise of the Prisme, measured by the Line G A, as the Base of the Solid G H hath to the Surface of the Water N O. The which is manifest: because the Mass of the Solid G A B H, raised above the first Levell E A B, is equall to the Mass of Water that is abased E N O A. Therefore, E N O A and G A B H are two equall Prismes; for of equall Prismes, the Bases answer contrarily to their heights: Therefore, as the Altitude A O is to the Altitude A G, so is the Superficies or Base G H to the Surface of the Water N O. If therefore, for example, a Pillar were erected in a waste Pond full of Water, or else in a Well, capable of little more then the Mass of the said Pillar, in elevating the said Pillar, and taking it out of the Water, according as it riseth, the Water that invirons it will gradually abate, and the abasement of the Water at the instant of lifting out the Pillar, shall have the same proportion, that the thickness of the Pillar hath to the excess of the breadth of the said Pond or Well, above the thickness of the said Pillar: so that if the breadth of the Well were an eighth part larger than the thickness of the Pillar, and the breadth of the Pond twenty five times as great as the said thickness, in the Pillars ascending one foot, the water in the Well shall descend seven foot, and that in the Pond only $\frac{1}{25}$ of a foot.

Why a Solid less grave *in specie* than water, stayeth not under water, in very small depths:

This Demonstrated, it will not be difficult to show the true cause, how it comes to pass, that,

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THEOREME III.

A Prisme or regular Cylinder, of a substance specifically less grave than Water, if it should be totally submerged in Water, stayes not underneath, but riseth, though the Water circumfused be very little, and in absolute Gravity, never so much inferiour to the Gravity of the said Prisme.

Let then the Prisme A E F B, be put into the Vessell C D F B, the same being less grave *in specie* than the Water: and let the Water infused rise to the height of the Prisme: I say, that the Prisme left at liberty, it shall rise, being born up by the Water circumfused C D E

A. For the Water C E being specifically more grave than the Solid A F, the absolute weight of the water C E, shall have greater proportion to the absolute weight of the Prisme A F, than the Mass C E hath to the Mass A F (in regard the Mass hath the same proportion to the Mass, that the weight absolute hath to the weight absolute, in case the Masses are of the same Gravity *in specie*.) But the Mass C E is to the Mass A F, as the Surface of the water A C, is to the Superficies, or Base of the Prisme A B; which is the same proportion as the ascent of the Prisme when it riseth, hath to the descent of the Water circumfused C E.

Therefore, the absolute Gravity of the water C E, hath greater proportion to the absolute Gravity of the Prisme A F; than the Ascent of the Prisme A F, hath to the descent of the said water C E. The Moment, therefore, compounded of the absolute Gravity of the water C E, and of the Velocity of its descent, whilst it forceably repulseth and raiseth the Solid A F, is greater than the Moment compounded of the absolute Gravity of the Prisme A F, and of the Tardity of its ascent, with which Moment it contrasts and resists the repulse and violence done it by the Moment of the water: Therefore, the Prisme shall be raised.

The Proportion according to which the Submersion & Natation of Solids is made. It followes, now, that we proceed forward to demonstrate more particularly, how much such Solids shall be inferiour in Gravity to the water elevated; namely, what part of them shall rest submerged, and what shall be visible above the Surface of the water: but first it is necessary to demonstrate the subsequent Lemma.

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