

VIII. *A short Account of Dr. Jurin's Ninth and last Dissertation De Vi Motrice, by Mr. John Eames, F. R. S.*

THE last Dissertation is \* new, and treats of the Motive Forces of Bodies, whether they are to be estimated by the Velocities, or the Squares of the Velocities, when the Masses are equal. The Original of this Dispute among the Mathematicians, the Author ascribes to a Slip committed by the celebrated Mr. *Leibnitz*, in the Year 1686. and the Continuance, to the Neglect of the Times, wherein equal Effects are produced. The one Side asserts all Causes to be equal, whose Effects are so, whether the Times, during which the Causes act, are shorter or longer. The other, on the contrary, maintains, that equal Effects may arise from unequal Causes, if the Times of Action are unequal; that consequently the Times, as well as the Effects, ought to be taken into the Account.

He wishes the Gentlemen on the other Side of the Question would produce some Experiment in their Favour, where the Equality of the Times is preserved; since all the Experiments they have hitherto made, and argued from, may justly be set aside, as incompetent, on the Account of the Inequality of the Times of Action.

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\* The Eight preceding Dissertations had been before printed separately; but were now all collected together, with the Addition of this Ninth, and published in one Volume in *Octavo*, London, 1732.

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The Author then proceeds to prove the Truth of the common Opinion of the Forces in equal Bodies being proportional to their Velocities. This he does by Three Mediums, the First taken from the Action of a single Spring upon the same Body : The Second from some Experiments of Mr. *Mariotte* ; the Third from the joint Action of several Springs upon Two unequal Bodies.

I. A single Spring, fixed to a moveable horizontal Table, is made to communicate to the same Body, Degrees of Force unquestionably equal, while the Degrees of Velocity communicated at the same time are also undoubtedly equal ; therefore the Forces are proportional to the Velocities.

II. In Mr. *Mariotte's* Experiments, the Impressions made upon equal Surfaces in the same Point of Time, are found to be in the Duplicate *Ratio* of the Velocities ; but the Masses or Numbers of impinging Particles are in the simple *Ratio* of the Velocities ; consequently, the Masses and Velocities conjunctly being in the Duplicate *Ratio*, *i. e.* as the Impressions, must also be as the Forces which made them : Which is the old Opinion.

III. A complicated or bent Spring interposed between Two unequal Bodies, acting upon each with an equal Pressure, and during an equal Time, must communicate equal moving Forces to each ; but their Velocities are by Experiment reciprocally proportional to their Masses ; therefore their Masses, drawn into their respective Velocities, are also equal, as were their moving Forces ; and by consequence their moving Forces are as the Masses and Velocities conjunctly : Which is the generally received Opinion.

In the Appendix, the Author answers some of the principal Arguments brought in favour of the contrary Side.

I. The first is drawn from the compound Motion of a Body along the Diagonal of a Rectangle, whose Sides represent the simple Motions. Here it is said, that the simple Forces are no-ways contrary to each other; that being united or added together in the compound Force, that compound Force will not be to both or either of the simple Forces, as the Diagonal is to both or either of the Sides; but as the Square of the Diagonal to the Sum of the Squares of the Sides, or to the Square of either Side respectively. He answers, The simple Forces, while they act in their proper Directions, are not contrary to each other, either Wholly or in Part; but when considered as contributing to the Motion of the Body in the Direction of the Diagonal, Part of the one acts contrary to Part of the other, and destroys it; as is evident, if you resolve each simple Force into two others, one acting along the Diagonal, the other in a Direction perpendicular to it. And then it is to be observed, that the Sum of the two former is equal to the Diagonal (while the two latter destroy each other): Which is perfectly agreeable to the old Opinion, but not at all to the new; for the demonstrating of which this Argument is brought.

II. The second Proof is taken from the equal Compression of Four equal Springs, before the Force was consumed, by the same Body moving with double the Velocity; and labours at the Bottom under the same Paralogism.

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III. The last Argument is founded upon the learned and ingenious Mr. *Poleni's* Experiment, wherein equal Cavities are formed in soft Substances, by equal Bodies falling from Heights reciprocally proportional to their Masses. This the Author sets aside, as insufficient, since the Times of forming these equal Cavities are unequal, and unequal Causes may produce equal Effects in unequal Times. The learned Mr. *Poleni* does, indeed, reply, and say, that the Formation of these Cavities seems to be instantaneous: But the ingenious Author shews the contrary, and that from a Position allowed of by *Poleni* himself, in his Reply.

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IX. *An Account of some remarkable Stones, taken out of the Kidneys of Mrs. Felles, upon opening her Body after her Decease, by Noah Sherwood, Surgeon.*

UPON opening the Body of Mrs. *Felles*, I found nothing amiss in any of the *Viscera*, till I came to the Kidneys, both of which were considerably enlarged, and of an oblong Figure, and had several Protuberances bunching out, which made the Surface appear almost like a Beeve's Kidney. Upon feeling them externally, I could plainly perceive they were caused by Stones: I took them out of the Body, and laid them open Longitudinally, and found in the Right Kidney several Stones of an irregular Figure, branched like Coral: They had extended themselves beyond the Capacity of the *Pelvis* on every Side,

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