

IV. *Experiments relating to the Resistance of Fluids, made before the Royal Society on Thursday, March the 30th, 1721. By the Reverend J. T. Defaguliers, LL. D. F. R. S.*

I Took a Ball of Gold of an Inch in Diameter, that had a little Stem of the same Metal, with a place on it to fasten a String to ; and having suspended it by a filken Thread too strong to lengthen by stretching, I made the Distance between the Center of the Ball, and the Point of Suspension equal to 12,5 Inches, then causing the Ball to vibrate in a Trough full of Water, (which had an upright Piece of Wood in the middle of one side with Pins or Keys from which the Ball hung, that the Center of Suspension might always be in the same place) I observ'd by looking from a Pin on one side of the Trough to a mark made opposite to it on the other side, whereabouts the String of the *Pendulum* (just above the Surface of the Water ; in which the Ball was quite immers'd) went after 14 Vibrations ; and by another Pin and opposite mark, also observ'd where it went to, after 28 Vibrations. Taking out the Water, I fill'd the Trough with Mercury, the length of the *Pendulum*, Point of Suspension and all other things remaining as before: then letting go the Ball in the Mercury from the same place whence it was let down when the Trough was full of Water ; (which was mark'd by a String stretched a cross to prevent mistakes) after one

one whole Vibration, it came very little short of the same mark as it had come to in Water after fourteen Vibrations, and when it vibrated twice in Mercury, it came to the same place it had done after between 26 and 28 Vibrations in Water; and this it did exactly several times.

Afterwards filling an upright Copper Pipe of four Inches Diameter with Mercury to the height of 3 Foot 10 Inches, and suspending the golden Ball in it by a short String about an Inch long, so as to have the Ball just immers'd under the middle of the surface of the Mercury; I caus'd it to be let down suddenly, and observing how long it was falling down to the bottom of the Tube, I found that the Experiment was disturb'd by the Ball's striking against the sides of the Tube, which retarded the fall of the Ball, and the more so the oftner the Ball struck. When the Ball was least retarded, it was only two Seconds and a half in falling, which must be taken as the true time of the fall of the Ball in an height of Quicksilver equal to 3 Foot 10 Inches; because when I try'd the Experiment again at home the first Day of *April* following, the Ball fell in the Mercury once or twice without striking the sides of the Tube at all, but not in less time than  $2\frac{1}{2}$  Seconds.

I also repeated the other Experiments at home, making the Golden *Pendulum* 39,2 Inches long, so as to make it vibrate but once in a Second, and then I found that it wou'd vibrate 5 or 6 times in the Mercury before the Vibrations became so small as not to be observ'd; and then the first Vibration in the Mercury ended very near where the 14th in Water had done; the second in Mercury ended where the 27th in Water had done, and observing the third Vibration  
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in Mercury, it ended exactly at the mark where the 40th in Water ended; and this was observ'd by several Persons as well as myself.

Then I weigh'd 14 penny-weight of the Mercury (in which I made the Experiments) first in the Air, then in Water, where it lost only one penny-weight and one Grain of its Weight; that is, it weigh'd in Air 336 Grains, and in Water 311, so that its specific gravity was to that of Water as 13,44 to 1.

As to the golden Ball which had Varnish and Cement upon it to keep the Mercury from sinking into it, I found it to weigh as follows,

Ounces dwt. gr.

It weigh'd in Mercury	1	00	18 or 498 gr.
in Water	5	01	00 or 2424 gr.
in Air	5	07	09 or 2577 gr.

I took the Wire and *Pendulum* of a long *Pendulum* Clock, and having fasten'd the golden Ball at the end of the Wire under the pendulous Weight that serv'd for the Clock, in order to make the Vibrations of the golden Ball in the Mercury continue longer, I did not find it to keep on the motion above one swing or two the longer for that help; neither did a round Ball of Lead placed upon the said Wire, just above the surface of the Mercury, help any more; and as I found some Inconveniences in these two last ways of making the Experiment, I rather chuse to rely upon those made with the Golden Ball hanging by a silken Thread of 39,2 Inches long, measuring from the point of suspension to the Center of the Ball.