

XLVII. *Of the different Quantities of Rain, which appear to fall, at different Heights, over the same Spot of Ground. By William Heberden, M. D. F. R. S.*

Read Dec. 7,
1769.

A COMPARISON having been made between the quantity of rain, which fell in two places in London, about a mile distant from one another, it was found, that the rain in one of them constantly exceeded that in the other, not only every month, but almost every time that it rained. The apparatus used in each of them was very exact, both being made by the same artist; and upon examining every probable cause, this unexpected variation did not appear to be owing to any mistake, but to the constant effect of some circumstance, which not being supposed to be of any moment, had never been attended to. The rain-gage in one of these places was fixed so high, as to rise above all the neighbouring chimnies; the other was considerably below them; and there appeared reason to believe, that the difference of the quantity of rain in these two places was owing to this difference in the placing of the vessel in which it was received. A funnel was therefore placed above the highest chimnies,

chimnies, and another upon the ground of the garden belonging to the same house, and there was found the same difference between these two, though placed so near one another, which there had been between them, when placed at similar heights in different parts of the town. After this fact was sufficiently ascertained, it was thought proper to try, whether the difference would be greater at a much greater height; and a rain-gage was therefore placed upon the square part of the roof of Westminster Abbey, being at such a distance from the western towers, as probably to be very little affected by them, and being much higher than any other neighbouring buildings. Here the quantity of rain was observed for a twelvemonth, the rain being measured at the end of every month, and care being taken, that none should evaporate, by passing a very long tube of the funnel into a bottle through a cork, to which it was exactly fitted. The tube went down very near to the bottom of the bottle, and therefore the rain, which fell into it, would soon rise above the end of the tube, so that the water was no where open to the air except for the small space of the area of the tube: and by trial it was found, that there was no sensible evaporation through the tube thus fitted up.

The following table will shew the result of these observations.

From

From July the 7th, 1766, to July the 7th, 1767,
there fell into a rain-gage fixed

	Below the top of a house.	Upon the top of a house.	Upon West- minster Ab- bey.
	inch.	inch.	inch.
1766 from the 7th of July to the end	3,591	3,210	2,311
August	0,558	0,479	} 0,508
September	0,421	0,344	
October	2,364	2,061	1,416
November	1,079	0,842	0,632
December	1,612	1,258	0,994
1767 January	2,071	1,455	1,035
February	2,864	2,494	1,335
March	1,807	1,303	0,587
April	1,437	1,213	0,994
May	2,432	1,745	1,142
June	1,977	1,426	} 1,145
from the 1st of July to the 7th	0,395	0,309	
	<hr/> 22,608	<hr/> 18,139	<hr/> 12,099

By this table it appears, that there fell below the top of a house above a fifth part more rain, than what fell in the same space above the top of the same house, and that there fell upon Westminster Abbey not much above one half of what was found to fall in the same space below the tops of the houses. This experiment has been repeated in other places with the same event. What may be the cause of this extraordinary difference has not yet been discovered ; but it may be useful to give notice of it, in order to prevent that error, which would frequently be committed in comparing the rain of two places without attending to this circumstance.

It is probable, that some hitherto unknown property of electricity is concerned in this phenomenon. This

power has undoubtedly a great share in the descent of rain, which hardly ever happens, if the air and electrical apparatus be sufficiently dry, without manifest signs of electricity in the air. Hence it is, that in Lima, where there is no rain, they never have any lightning or thunder (*a*) ; and that, as M. Tournefort was assured, it never rains in the Levant but in winter, and that this is the only season in which any thunder is heard (*b*). If this appearance therefore could be accounted for, it would probably help us to some more satisfactory causes of the suspension of the clouds, and of the descent of rain.

(*a*) See the English translation of the voyage of Don George Juan and Don Antonio de Ulloa to South America, vol. II. book i. chap. 6. p. 69 and 79.

(*b*) Voyage du Levant, let. X. p. 429.