

action of a pair of bellows, its drawing water if immersed in water, its refusing to open when the vent is stopped up. The action of a cupping instrument, in which the air is rarefied by fire; the fact that water is supported when a full inverted bottle is placed in a basin; or when a full tube, open below and closed above, is similarly placed; the running out of the water, in this instance, when the top is opened; the action of a siphon, of a syringe, of a pump; the adhesion of two polished plates, and other facts, were all explained by the *fuga vacui*. Indeed, we must contend that the principle was a very good one, inasmuch as it brought together all these facts which are really of the same kind, and referred them to a common cause. But when urged as an ultimate principle, it was not only *unphilosophical*, but *imperfect* and *wrong*. It was *unphilosophical*, because it introduced the notion of an emotion, Horror, as an account of physical facts; it was *imperfect*, because it was at best only a law of phenomena, not pointing out any physical cause; and it was *wrong*, because it gave an unlimited extent to the effect. Accordingly, it led to mistakes. Thus Mersenne, in 1644, speaks of a siphon which shall go over a mountain, being ignorant then that the effect of such an instrument was limited to a height of thirty-four feet. A few years later, however, he had detected this mistake; and in his third volume, published in 1647, he puts his siphon in his *emendanda*, and speaks correctly of the weight of air as supporting the mercury in the tube of Torricelli. It was, indeed, by finding this horror of a vacuum to have a limit at the height of thirty-four feet, that the true principle was suggested. It was discovered that when attempts were made to raise water higher than this, Nature tolerated a vacuum above the water which rose. In 1643, Torricelli tried to produce this vacuum at a smaller height, by using, instead of water, the heavier fluid, quicksilver; an attempt which shows that the true explanation, the balance of the weight of the water by another pressure, had already suggested itself. Indeed, this appears from other evidence. Galileo had already taught that the air has weight; and Baliani, writing to him in 1630, says,² "If we were in a vacuum, the weight of the air above our heads would be felt." Descartes also appears to have some share in this discovery; for, in a letter of the date of 1631, he explains the suspension of mercury in a tube, closed at top, by the pressure of the column of air reaching to the clouds.

² Drinkwater's *Galileo*, p. 90.