

happen, the thing thrown must have a certain proportion to the agent which throws it? Is it that what is thrown or pushed must react<sup>13</sup> against that which pushes it; and that a body so large as not to yield at all, or so small as to yield entirely, and not to react, produces no throw or push?" The same confusion of ideas prevailed after his time; and mechanical questions were in vain discussed by means of general and abstract terms, employed with no distinct and steady meaning; such as *impetus, power, momentum, virtue, energy*, and the like. From some of these speculations we may judge how thorough the confusion in men's heads had become. Cardan perplexes himself with the difficulty, already mentioned, of the comparison of the forces of bodies at rest and in motion. If the Force of a body depends on its velocity, as it appears to do, how is it that a body at rest has any Force at all, and how can it resist the slightest effort, or exert any pressure? He flatters himself that he solves the question, by asserting that bodies at rest have an occult motion. "Corpus movetur occulto motu quiescendo."—Another puzzle, with which he appears to distress himself rather more wantonly, is this: "If one man can draw half of a certain weight, and another man also one half; when the two act together, these proportions should be compounded; so that they ought to be able to draw one half of one half, or one quarter only." The talent which ingenious men had for getting into such perplexities, was certainly at one time very great. Arriaga,<sup>14</sup> who wrote in 1639, is troubled to discover how several flat weights, lying one upon another on a board, should produce a greater pressure than the lowest one alone produces, since that alone touches the board. Among other solutions, he suggests that the board affects the upper weight, which it does not touch, by determining its *ubication*, or *whereness*.

Aristotle's doctrine, that a body ten times as heavy as another, will fall ten times as fast, is another instance of the confusion of Statical and Dynamical Forces: the Force of the greater body, while *at rest*, is ten times as great as that of the other; but the Force as measured by the *velocity* produced, is equal in the two cases. The two bodies would fall downwards with the same rapidity, except so far as they are affected by accidental causes. The merit of proving this by experiment, and thus refuting the Aristotelian dogma, is usually ascribed to Galileo, who made his experiment from the famous leaning tower of Pisa, about 1590. But others about the same time had not over-

<sup>13</sup> ἀντιπελάσειν.

<sup>14</sup> Rod. de Arriaga, *Cursus Philosophicus*. Paris, 1639.