or disputes that a terrestrial body which is free to obey this law will be attracted towards the earth's surface at a definite and constantly accelerating rate of movement. Until within quite a recent period, the human race has had very little experience or knowledge of truth, as thus defined. A few great natural phenomena, such as the recurring changes in the appearance of the heavenly bodies, and the certainties of mathematical demonstration, the latter known only to the learned, furnished the sole examples of truth which our ancestors once possessed. Beyond these, the sum of human beliefs was composed of what are properly called opinions, that is to say, of "persuasions of the mind, without proof or certain knowledge," and these opinions have always been, and are at present, largely made up of erroneous interpretations of familiar facts. We need not go back for an illustration to the time when the rising and setting of the sun, and the succession of the seasons, were attributed to the personal activity of the deities of a heathen mythology; but may find one, within the memories of many who now hear me, in the circumstance that the variations of the barometer were, until recently, attributed solely to differences in the actual density of the earth's atmosphere.

Now the primary and essential condition of truthfulness, or strict adherence to truth, in the sense in which I use the word, is that the mind should be conscious of the character of its own beliefs and impressions, and should distinguish those which are certainly true from those which are in various degrees possible or probable; and, in order that this distinction may not be suffered to drift out of sight, it should be constantly embodied in language, and expressed in the words and phrases which are habitually employed. Language is not merely a means of utterance, but is also an instrument of thought; and it is impossible to think clearly and truthfully so long as we speak carelessly and obscurely. To be perfectly truthful, in this scientific sense, instead of being something simple and easy, is among the last attainments of the disciplined and cultivated intellect; and, if I may quote from an address which I once delivered elsewhere, I would say that it is no more possible for children, and servants, and uneducated people generally, to speak the truth, than it would be for you or me, without previous training, to walk along a tight-rope. The tendency of the mind, like that of the body in the case supposed, is to fall over to one side or the other, to lose its balance as between truths and opinions; and, without any moral delinquency, to put the latter in the place of the former. An endeavour to describe events which had strongly excited the emotions would be fatal to the scientific veracity of anyone but a philosopher.

Among the many conditions which have served to impede the general diffusion of scientific truthfulness, we must, I apprehend, give a very prominent place to the confusion which frequently exists between accurate descriptions of events, and erroneous conjectures about the causes to which these events should be ascribed. For a convenient example, I may return to one which has already been mentioned, namely, the frequent variations in the height of the column of mercury in the barometer. It was discovered by Torricelli, nearly two hundred and fifty years ago, that the atmosphere, which surrounds the earth, exerts, by reason of its weight, an appreciable pressure upon the earth's surface, and that the amount of this weight, and hence the degree of the pressure, may be measured by the height of the column of mercury which it will sustain. The height of the mercurial column was found to vary freely, in these latitudes, between about twenty-eight and thirty-one inches; and it could be demonstrated that, when the barometer was high, the atmospheric pressure was greater, the superincumbent column of air heavier, than when the barometer was low. In my youth, and even when I was no longer young, it was considered an adequate explanation of the facts to say that not only the superincumbent column of air, but the air itself, was heavier at some periods than at others, that the air was more or less dense, that a cubic foot of it at certain times would weigh more or less than the same quantity at other times. It was even experimentally determined that air containing much moisture is actually, bulk for bulk, lighter than dry air. Without entering into details, I may say that the present belief is that this explanation was erroneous, at least, in the sense of being insufficient; and that the local variations in the weight of the atmosphere do not depend entirely upon the air being heavier at one time than at another, but also, and in a still greater degree, upon there being more of it, a higher column, over the spot where the barometer is high, and less of it, or a lower column, over the spot where the barometer is low. In other words, if we could stand outside of the earth's atmosphere and look down upon it, it is believed that we should see its surface exhibiting, on an enormous scale, irregularities something like those which we see on the surface of the ocean when we look down upon it from the deck of a ship; that is, we should see the crests of waves separated by intervening depressions. A high barometer is now held to mean that the spot where the barometer is high is beneath the crest of an elevation; a low

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