

sides oral testimony, and that it is as necessary to be able to judge of the validity in each case, of these other kinds of evidence, as it is to be able to judge of the value of testimony. He would learn that, unless he were to be a professed mathematician, a knowledge of the bare truth of the *pons asinorum* was a matter of no moment, the important thing was to see how that truth was arrived at, and how it was demonstrated; the educative factor present in the study was the exercise of the reasoning faculties, and of the powers of orderly arranging and of clearly presenting all the parts of a somewhat long argument.

So in the experiment with the sovereign and the feather, the mere testing of the truth or the falsehood of the statement that, if the resistance of the air be got rid of, a feather will fall earthward as fast as a sovereign, is not the chief thing aimed at. In fact, this statement should not be advanced prior to the performance of the experiment, but the fact stated in it should be discovered by the pupils for themselves from the experiment; and I beg to add that, had Professor Todhunter ever actually tried the experiment with the common apparatus, he would possibly have found the discovery of the fact not quite so simple a matter for a boy as he evidently imagined it to be.

But Professor Todhunter, while admitting that a boy takes more interest in seeing an experiment performed or in performing it for himself than in merely hearing a statement of its truth, doubts the educational value of the appeal to the senses. Any teacher of natural science worthy of the name of teacher would, from his experience, be able instantly to explain why this increase of interest, and instantly to set all doubts regarding the matter to rest. *There seems in many minds to be an almost total separation between words and the things they represent, ex-*

*cept as regards constantly recurring incidents of their daily life.* Hence words seem to have no power in such cases to call up and keep before the mental vision a distinct image of the thing reasoned about. In fact, what is called the scientific imagination seems almost wanting in many minds until a severe course of training in science arouses the dormant faculty, and develops into the actual and the active what otherwise would have remained an unnoticed and neglected potentiality. The consequence is, that the teacher who depends on verbal statements alone can never be sure that the ideas so clear to himself are correct, if at all apprehended by his pupils, and that these are not increasing their ignorance rather than their knowledge. Many minds which seem to become sluggish, or to wither away when fed with what to them are the dry husks of words, are roused to activity and intelligence when they are directed to the study of things and the relations of things, when they are brought face to face, so to speak, with the actual phenomena of the world around and within them.

But before I pass from this, let me point out that the guinea-and-feather experiment, if *successfully* performed, is about as bad an example of an educative experiment as could well be selected. The bare fact to be observed would stand out too distinctly, too completely disentangled from other phenomena to give it any value in training the observing faculties of any but mere infants, while the inferences and deductions from the results of the experiment are too abstruse for any but those who have advanced some way in quantitative analysis of phenomena. Moreover, the mere experimental result can be obtained without any elaborate apparatus, while the deduced propositions can be, and in actual practice generally are, arrived at by simpler means. In truth,