

they too have intelligence, and that they exhibit at times a very respectable amount of common sense. The stories about them are strictly true, and from their very nature strictly new. But the volume tells also of many a two-footed friend, and the last few chapters almost exclusively treat of the fishes of the coast. There is much in this portion of the volume of interest to the scientific worker; there is much in every part of it to make it of value to those who care to learn something of the habits of Tasmanian beasts, birds, and fishes. One feature of the volume must be specially noticed—the eight coloured drawings, excellently chromolithographed from the water-colour drawings of the author. From a personal knowledge of the splendid colouring often present in freshly-caught tropical fishes, these plates are, we should say, by no means too brilliant. Four are devoted to some of the strange, wondrously-coloured fishes, and four to flowers, fruits, and insects.

This volume would be an excellent and not over-expensive Christmas present, which may lie on any table however select, and be read by any person however critical.

### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### Mr. Spencer and Prof. Tait

PROF. TAIT'S explanation itself shows that the word commonly applied to products of imagination, was applicable to his statements; for the only justification he assigns is that he "assumed," that is to say, imagined, that his substitution of "definition" for "formula" must have been the ground of offence. How inadequate a plea this is, will be seen on re-reading the questions I put, which were these:—

"He [Prof. Tait] says that because he has used the word 'definition' instead of 'formula,' he has incurred my 'sore displeasure and grave censure.' In what place have I expressed or implied displeasure or censure in relation to this substitution of terms? Alleging that I have an obvious motive for calling it a 'formula,' he says I am 'indignant at its being called a definition.' I wish to see the words in which I have expressed my indignation; and shall be glad if Prof. Tait will quote them. He says:—'It seems I should have called him the discoverer of the formula!' instead of 'the inventor of the definition.' Will he oblige me by pointing out where I have used either the one phrase or the other?"

Every reader would infer that, for these specific statements made by Prof. Tait, there are specific foundations, which could be named when asked for. He does not name them, for the sufficient reason that they do not exist. Unable, as he says, to see in the passages I quoted from him, anything else to call for "censure" (a strange inability!), he "of course" assumed that this change of terms was the ground of censure. And the assumption thus made, is the only warrant he assigns for these positive assertions.

This is not all, however. Prof. Tait says:—"I could not have ventured to suppose that Mr. Spencer 'did not even know that he was in the habit of saying formula rather than definition.' This naive confession cannot but be correct." Of Prof. Tait's motive for putting this statement of mine in italics and calling it naive, the reader may judge for himself. How entirely correct it is, and how well Prof. Tait might have "ventured to suppose" it, will quickly appear. For there is proof that I am not in the habit of always saying formula rather than definition; and Prof. Tait had the proof before him. In the note on page 565 of the Appendix forming the pamphlet in question—a page which Prof. Tait must have read, since it concerns Mr. Kirkman and himself—I have used the word "definition." So that not only had Prof. Tait no evidence on which to base his distinct statements,

but there was under his eyes positive evidence which negated them.

Very possibly it will be said that the question about my uses of these words is a trivial one. But this is not the question. The question is whether it is allowable to make an opponent look absurd by ascribing to him, in a quite positive way, things which he has neither said nor implied; and that, too, when he has implied the contrary. HERBERT SPENCER

#### Criterion of Reality

WILL you kindly allow a learner to ask for the criterion according to which Kinetic Energy and Work are real things, while Momentum and Force are unreal? Prof. Tait says  $\frac{1}{2}mv^2$  and  $wh$  express real things, but  $mv$  and  $w$  unrealities (NATURE, vol. xxiii. p. 82).

If  $w$  be "as unreal as is the product of a quart into an acre," how is it that  $wh$  is real? The illustration of quart and acre is as applicable or inapplicable to the one as to the other. In both cases we take the product of two numbers, not two concrete magnitudes, which of course it would be absurd to speak of multiplying together. In one case the product is the number of units of Momentum, in the other case it is the number of units of Kinetic Energy. If it be said that a thing is real if its quantity cannot be altered, and *vice versa*, why is  $mv^2$  said to be real, and  $mv$  unreal? They vanish together. When Prof. Tait asserts "there is no such thing as Force," "it is merely a convenient expression for a certain rate" (NATURE, vol. xiv. p. 459), he seems, if I may venture to say so, to confound the measure of Force with Force itself, and to lay himself open to Mr. Spencer's comment that "a relation changes the state of a body." Certainly  $mv$  is not a thing, but neither is  $mv^2$  a thing: yet the latter is the measure of something which Prof. Tait asserts to be "as real as matter itself": why is not that of which the former is the measure equally real? E. G. Bardsea

[What Prof. Tait asserts may be correct or not, but it is self-consistent. He asserts in his lecture on "Force" (NATURE, vol. xiv. p. 462) that matter and energy must be looked on as real things, because we cannot change the amount of either. Such expressions as  $\frac{1}{2}mv^2$ , and  $wh$ , are to be considered as wholes, not as products of two or more factors. This separation into factors (where one is  $mv$ , or  $w$ , for instance) he asserts to be a relic of the old erroneous belief in the trustworthiness of the impressions made on the "muscular" sense.—ED.]

#### Landslips

IN NATURE, vol. xxii. p. 560, I pointed out that landslips often occurred in the Salt Districts. I did not then expect that I should so soon be able to refer again to the subject; but on December 6, at an early hour in the morning, one of the largest subsidences and landslips ever known in Cheshire occurred. I pointed out that whenever fresh water reaches the rock salt it dissolves it. In certain districts in the immediate neighbourhood of Northwich the ground is completely honeycombed with rock-salt mines that had been worked out and abandoned. Into many of these fresh water had penetrated, and had become by solution strong brine. This brine has of late been extensively pumped up, and many of these extensive cavities had become nearly empty. The thin crust of rock salt forming the roof of these old mines had become gradually thinner, owing to its solution by water, and on Monday morning the roof of one pit gave way, and let the superincumbent earth down into the mine, rifling and opening the ground to the surface. The surface rift passed across the bed of a large brook, and the water of the brook ran through the crevice into the mines below. In a short time the water made a more extensive cavity, and as the brook was cut in two about 200 yards above its entrance into a large lake that was drained by the Weaver River, the water in the lower portion of the brook and of the lake, as well as of the Weaver, commenced to return and run down the enlarged cavity. For four or five hours this return stream increased in velocity, pouring down the crater-like hole. Notwithstanding the water of the brook and the return water, as well as a large body of water from another small lake entering this cavity, the water standing in the funnel-shaped hole gradually lowered. The velocity of both portions of the brook increased, and such was the force of the water that the bottom of the brook for 100 yards was scooped out from 2 feet in depth to 10 feet, and the banks were washed away,