Letters to the Editor.

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Relativity.

THE relativist position is stated as being "that only relative motions are of physical importance."

If this is meant to apply to rotation as well as to motions of translation, and to deny that rotation is absolute, and independent of the relation of the revolving body to anything outside itself, I would suggest that a relativist should try the following experiment. Let two casks, A and B, of suitable sizes, be placed one within the other (A inside), and so mounted that either can be rotated independently. Now let the believer in relativity place himself inside A so that he can see nothing but its inner surface. So far as appearances are concerned, he will not know whether A is stationary or in motion.

First let A be stationary and let B be made to revolve at, say, 1000 revs. per minute. This will cause no change of any sort in the sensations of the occupant. Next, with B stationary, let A be given the same angular velocity for a minute or two. If the experimenter survives this trial, he will be in a position to assert that the "physical importance" of the angular velocity of A with reference to B is not the same as that of B with reference to A. So far, however, as the geometrical relations of A and B are concerned, it is a matter of indifference which of the two is revolving. A. MALLOCK.

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Toads and Red-hot Charcoal.

TOADS are associated with some wonderful myths, and my scepticism was naturally great when my friend Mr. H. Martin Leake assured me, while on a visit to Cawnpore in October of 1915, that toads would eat red-hot charcoal. An after-dinner demonstration, however, soon dispelled my doubts. Small fragments of charcoal heated to a glowing red were thrown on the cement floor in front of several of the small toads (usually *Bufo stomaticus*) which so commonly invade bungalows at that time of year, and, to my surprise, the glowing fragments were eagerly snapped up and swallowed. The toads appeared to suffer no inconvenience, since not only did they not exhibit any signs of discomfort, but, on the contrary, several toads swallowed two or even three fragments in succession. A probable explanation of the picking-up is that the toads mistook the luminous pieces of charcoal for glow-worms or fireflies, the latter being numerous in the grounds of the Agricultural College at Cawnpore in October; but this does not account for the swallowing of the hot particles—the absence of any attempt to disgorge. I repeated the experiment at Allahabad in August, 1916, with the same results (the toads even attempting to pick up glowing cigarette-ends), though I have never observed glow-worms or fireflies in Allahabad at any time of year.

The fact that some toads seized several hot particles in succession would seem to imply either that the heat was not felt (which seems incredible), or that memory is entirely absent in toads; but since toads most certainly come to associate a given time of day with the supply of food, *i.e.* remember, this latter explanation seems to be equally incredible. The truth must be that the incentive to seize an object (a luminous point in this instance) usually associated with an insect is so strong that even acute pain is no deterrent when the experience is limited—the lessons of experience out of the ordinary require to be "burned" into the toad intelligence by sheer repetition, just as the imprisoned shark which repeatedly bruises its snout against the glass of its tank has the lesson "knocked" into it in time. I may add that I unfortunately neglected to examine the toads post-mortem, and that I have recently repeated these experiments with *Bufo vulgaris* in England with entirely negative results. W. N. F. WOODLAND.

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Active Hydrogen.

IN March last I observed an interesting phenomenon while conducting certain experiments, in the Maharajah's College, Vizianagaram, with detonating mixtures with excess of hydrogen when they are subjected to the silent electric discharge in an ozoniser. In one experiment the oxy-hydrogen mixture, after leaving the ozoniser, was allowed to pass through an alkaline solution of potassium permanganate. In the course of the experiment an electric spark accidentally took place in the mixture, and as a consequence an explosion occurred in which a part of my apparatus was smashed to pieces; but to my surprise I found that the whole of my permanganate solution turned green at once.

It was surmised from this that the instantaneous reduction might be due to the presence of an active modification of hydrogen produced in the circumstances, since molecular hydrogen brings about the same change very slowly. In order to study the problem more conveniently, I filled a Hofmann eudiometer with an alkaline solution of potassium permanganate, and a few cubic centimetres of an explosive mixture with excess of hydrogen (3 vols. of hydrogen and 1 vol. of oxygen) were admitted into the explosion tube and the mixture was sparked; as soon as the spark passed through the solution it turned green.

With the object of testing further the reducing efficiency of this new form of activated hydrogen, its effect was examined in a number of reactions. It was thus found that with this hydrogen an alkaline solution of indigo was converted into indigo white, ferric chloride into ferrous chloride, potassium nitrate into potassium nitrite, arsenious acid into arsine, potassium perchlorate into potassium chloride, and a number of other reactions were also tried with like results.

Some references to the literature relating to this subject of active hydrogen may be of interest. In 1913 Sir J. J. Thomson was led to conclude from examination of the paths of positively charged particles that they "revealed the presence of particles having an atomic weight of 3, presumably triatomic molecules of hydrogen." Duane and Wendt showed, in 1917, that when hydrogen is exposed to the bombardment of α-particles from radium emanation a contraction in volume occurs, a fact which has been incidentally observed by Usher, and confirmed recently by Lind. In 1912 Dr. Langmuir discovered an active modification of hydrogen by heating a metallic filament in hydrogen at low pressures. Again, so late as May last, Gerald and Robert S. Landauer published a paper on triatomic hydrogen in the Journal of the American Chemical Society.