Letters to the Editor.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Band Spectrum of Mercury from the Excited Vapour.

IN my letter dated Mar. 1, which appeared in NATURE of Mar. 12, p. 387, it was stated that the 'forbidden' line λ2270 appeared in the excited vapour in association with the band spectrum.

I now find that the other 'forbidden' line at the computed position λ2655·60 also occurs in the excited vapour, and much more strongly than λ2270. The observed position of the line is λ2655·73. This measurement might doubtless be improved upon, but the line is very definitely on the less refrangible side of the line λ2655·13 in a comparison arc spectrum. The 'forbidden' line is absent from the latter, and, so far as I know, it has not been observed before in any circumstances. RAYLEIGH.

Terling Place, Chelmsford,
Mar. 8.

Truth or Convenience.

DR. WILDON CARR'S letter in NATURE of Feb. 5, p. 199, serves as a reminder that the mathematics of relativity is one thing and the philosophy based on it is another; so I take advantage of the opportunity to comment controversially on a few philosophic points, and especially to protest against a comparatively recent anti-scientific tendency to teach that we are not making an attempt to ascertain actual truth about the universe, but only to formulate propositions that are practically helpful and convenient.

In explaining the theory of relativity in ordinary language, stress is usually laid on the 'observer,' and at one time we were told that metaphysical ideas were evaded by attending solely to what could be observed with the aid of measuring instruments, and that thus physicists might be placated, since they were dependent on laboratory measurements for all their knowledge. But if physicists had proceeded solely on that basis, they would not have got very far in their generalisations and theories. The laws and conceptions of physics, like those of mechanics and geometry, are surely ideal; the exact truth of their propositions holds, not in the world of experience, but in an ideal world the axioms of which are infinitely true if true at all; experience might enable these theorems to be rejected as false, but their accuracy could not be tested by any precision of measurement, which must be limited to the fifth or sixth or perhaps the ninth decimal place.

The laws of motion, for example, and any other simple generalisation like Ohm's law, originate as hypothetical challenges, to be definitely disproved if possible, or to be verified approximately, or to be modulated by subsequent refinement, or to be applicable subject to certain conditions. Meanwhile they are taken as precisely true. Newton's law that acceleration is proportional to resultant force was treated as exact; the minor dependence of the ratio on speed was a discovery two centuries later. The constant ratio of e.m.f. to current in a metallic conductor may be modified by many circumstances of which the molecular disturbance caused by the current itself is chief. The law, moreover, may be found to apply to liquids, and be inapplicable to rarefied gases. Departure from an ideal law in any given case is a matter of measurement.

Truth is in the ideal. The actual world is an approximation thereto. No one has ever encountered an exact circle or triangle, but the Euclidean propositions apply to actuality as near as makes no matter. That is perhaps the excuse for saying that we do not aim at truth; but it is a bad excuse. We always aim at truth beyond the range of our experience or measuring achievements. Absolute truth may be an unattainable ideal, but it is our clear and permanent aim.

Similarly, the relativity axioms are incapable of any but approximate verification. They, too, belong to the ideal. This applies obviously to the equations, which as they stand are superhumanly accurate, but it also applies to the verbal interpretation or elucidation of such equations in terms of different observers. On no practical grounds can it be held that measurements made by an observer flying past the instruments, or the thing to be observed, are just as good as those made by one who is sitting still, and that we have no reason for preferring the observations of one more than those of the other. I take it that all the modes of statement in which different observers are mentioned are merely attempts to put into words, and thus make clear to literary philosophers, the meaning (say) of the Larmor-Lorentz transformation. From this point of view no doubt an 'observer' can be replaced by a photographic plate, except that neither a photograph nor anything else has a meaning until it is interpreted by a mind. But so far as the record is concerned, it does not matter whether the images are on the retina of the eye or on something else: the ultimate interpreter, in either case, is interpreting a physical record.

The exposition of the basal principles of relativity by Dr. Jeans in the new volumes of the "Encyclopædia Britannica" is a masterly production, and as he does not enter upon philosophy, save in a few subordinate sentences near the end, no fault can be found with it. But when it comes to an application of those principles to philosophy the ground is far less secure. The subordinate sentences I refer to in this fine article are where he says:

> "Relativity teaches us that this velocity $[c \pm u]$ is always precisely c, and this in itself disposes of the ether of Faraday and Maxwell."

But surely the teaching of relativity on that subject is an assumption, based no doubt upon negative experiments and highly plausible, but not really verified; hence its force as an abolishing agent is by no means overpowering. It might even be said that the relativity rule for compounding any two velocities, u and v, essentially implies a medium in which the motions occur, because its characteristic constitutional velocity c is inevitably involved. Nevertheless it may be fully admitted that an ether subject to the ordinary laws of dynamics, so as to be illustrated by mechanical models, has had to be abandoned. All our science and natural laws have hitherto been limited to matter. Directly we go beyond that we are in the dark: somewhat literally our senses leave us. That is why I presume we are so loath to admit the existence of anything immaterial.

Again, it is said that it "is impossible to discriminate between gravitational and centripetal acceleration"; but surely one has relation to an axis, the other to a centre. At any given place discrimination may be impossible; but taking the whole surface of the earth into consideration it is not impossible. It is well known that they have