LETTERS to the EDITOR

Thanks Again

Sir:

It has been called to my attention that the role of the Netherlands Physical Society in organizing the Amsterdam Conference on the Physics of Metals last summer appeared to have been slighted in the article on The Physics of Metals in the January number of Physics Today. The conference was held, as the article stated, in connection with the General Assembly of the International Union of Pure and Applied Physics; but it was organized by the Netherlands Physical Society, which issued the invitations, and was responsible, as the article indicated, for its conspicuous success. No one who was present had anything but the highest praise for the initiative and skill shown by the officers and members of the Netherlands Physical Society in the organization of this outstanding conference and in their hospitality, and it is regrettable that this was not sufficiently stressed in the article.

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Physics Tomorrow

Sir:

Dr. Gamow suggests in his article, "Any Physics Tomorrow?" in the January issue, that theoretical physicists hope that "in nature there are incidental numerical constants, i.e. pure numbers which cannot be derived from purely mathematical reasoning." But reasoning from what premises? Those of pure mathematics have no reference to the physical world; if he means, by arguments called by Eddington "epistemological," we must consider Eddington's unique contribution to this field.

The idea that Eddington's theory was specially constructed to derive "from purely mathematical reasoning" such constants as the fine-structure constant, contains two common errors. Firstly, it forgets that Eddington's theory is an attempt at a very general systematization of thought and the derivation of the fine-structure constant is but one of its consequences. Secondly, that Eddington repeatedly emphasized that it was based on examination of physical procedure. Anyone who commits these errors is certain to find the theory incomprehensible.

But there is much difference between finding a theory incomprehensible, and stating that no one can understand it; and when the theory stands alone in its field the need is, not to brush it aside as too difficult, but to make the necessary effort to follow it. In fact, "Funda-

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mental Theory" forms, for those disinclined to believe it, a worthy object for disproof.

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More Physics Tomorrow

Sir:

The editor's recent invitation to indulge in unbridled speculation coupled with Professor Gamow's concurrently presented example of the art ("Any Physics Tomorrow?") have prompted the following presentation of a case which seems to show that we shall certainly have plenty of problems for physics tomorrow and perhaps even for the day after. When there is mention of the convergence of the field of physics, it is very tempting to brush it off by reciting the usual stories of the attempt to close the Patent Office in 1840 because everything possible had then been invented, and the statement attributed to a famous physicist at the turn of the century that all the basic principles of physics had then been discovered and that the only further work lay in the improvement of measurements.

In considering the problem on a basis of precedent, one could also mention a number of skeletons now hanging in the closet of the natural philosopher such as the caloric theory of heat, the ether medium, or the phlogiston theory of oxidation, and one could show that the very improvement in accuracy of measurement mentioned above had more than once resulted in revolutionary changes such as the introduction of quantum theory. Most such changes have so far introduced a divergence rather than a convergence of the field.

A study of these historical events, however, cannot give any assurance of the future, because the historical series is too short to allow an accurate extrapolation. A better case can be found in an examination of the methods used in "discovering" a new constant, a basic principle, or a fundamental particle.

Let us commence with the basic assumption necessary to all operational sciences that a reasonably orderly universe exists, independent of our power to observe it or to predict its operations and let us say that its state can be represented by the statement of a multitude of independent quantities. On this basis we may represent the state of the universe by a point or a small region in a multi-dimensional mathematical space and we may regard the progress of the universe from state to state as a motion of the representative point.

If we were gifted with omniscience, the shape of the multi-dimensional surface or the nature of the probability density (depending on whether the point moves randomly or not) would be immediately clear to us, and physics

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