a temporary support on which many particles are removed from one point to another. Hardy's work on static friction shows that this tearing away occurs under quite light pressure, despite the possible presence of surface layers of gas. Clearly the random removal of particles, only some of which need be of molecular dimensions, from one point of the surface to another, must result in forming an amorphous layer, if continued long enough.

If there is energy enough to move the surface molecules as a result of intense thermal vibrations —which is all that melting amounts to—there must be ample energy for the mechanical transportation of my hypothesis. Thermal vibrations are a notoriously inefficient method of producing a specific mechanical result. The result required is the moving of molecules from an ordered space lattice to a disorderly, amorphous layer; and the motion of the polisher, picking up and redepositing particles elsewhere, seems admirably adapted to produce this.

I have some difficulty in accepting Mr. Macaulay's theory that the polisher only touches the surface at a point. This seems almost incredible, with a moving piece of flexible material such as wash-leather. Further, even supposing that the contact approximates to point contact in the first stages of polishing, through projections on the surface alone touching the polisher, one would expect that these points would be worn or melted away long before the completely polished, plane surface was attained, so that there would be contact over considerable areas in the later stages of polishing. I should expect heat to be lost from the area polished at nearly the normal rate of loss from a plane area the size of the apparent contact between polisher and surface.

N. K. ADAM.

The University,
Sheffield, Feb. 3.

Wheat in 3500 B.C.

A SHORT time ago I received from Prof. Poulton and Sir John Russell small samples of wheat grains found by Prof. Langdon, of Oxford, in a vase on the site of an ancient Sumerian house at Jamdet Nasr, seventeen miles north of Kish in Mesopotamia.

The wheat, which Prof. Langdon dates 3500 B.C., is of much interest, not only on account of its antiquity, but also because its grains are of a type associated with the more highly developed races of this cereal.

The identification of the races of wheat by their grains only is always difficult, and sometimes impossible. In this case, however, I conclude, from the features noted below, that they belong to a variety of Rivet wheat (*Triticum turgidum*), a wheat, so far as I am aware, unknown to the ancient Egyptians, and the first authentic ancient sample of this race which I have seen.

The characters of these grains, namely, large average size, blunt apex, very prominent dorsal hump, and asymmetry or lop-sidedness of some of the grains due to pressure of the flowering glume on one side, are all characters of *T. turgidum*, and the grains are matched exactly by several modern varieties, which we grow annually at the Agricultural Botanic Garden at Reading (see Fig. 1).

According to a letter from Prof. Langdon in the *Times* of Feb. 3, the opinion has been expressed that the grains are those of Bread wheat (*Triticum vulgare*) or of Club wheat (*T. compactum*), but the grounds upon which these conclusions are based are not given.

The view that they belong to *T. vulgare* may, I think, be neglected, for their prominent dorsal hump and the asymmetrical form of some of the grains are opposed to this identification. I am also unable to agree with the suggestion that they are grains of *T. compactum*. All known varieties of this race of wheat have been grown here and studied during the last thirty years, and the majority possess grains similar in form to those of *T. vulgare*, but smaller; a few uncommon representatives have the dorsal hump of *T. turgidum*, but the large size of Prof.

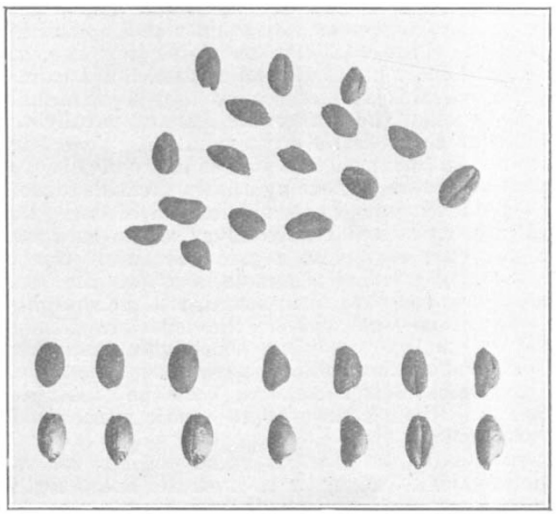

FIG. 1.—Upper group: grains of wheat found in a vase on the site of a Sumerian house (3500 B.C.). Two lower rows: grains of modern Rivet wheat (*Triticum turgidum*) for comparison. (Natural size.)

Langdon's grains is against their classification with these.

All trustworthy evidence we possess shows that Emmer (*T. dicoccum*) was the wheat first grown by the oldest civilised peoples, and I am of the opinion that these grains belong to the Emmer group of wheats; they leave us still without any clue to the origin of the Bread wheat series, but I hope that further discoveries in the region from which these have come will ultimately provide material for the solution of the problem.

Apart from its botanical interest, Prof. Langdon's discovery is of much importance, in that it has proved that the Sumerians were in possession of an advanced type of wheat at a very early date.

JOHN PERCIVAL.

The University, Reading,
Feb. 5.

The Length of Light Quanta.

AT the meeting of the American Physical Society in December last, Lawrence and Beams reported experiments showing that the length of light quanta is smaller than 3 cm. Experiments were made by me in the spring and summer of 1926 on the same subject with a similar result, though by a different method. While the experiments were begun, however, a theoretical consideration showed that a positive result would be very improbable, and so the results were not published. The reasoning was as follows:

It is well known that it is possible to obtain an oscillogram of a radio wave and that by a proper choice of apparatus (Dufour oscillograph) one can photograph the wave form for periods which are small fractions of a wave-length. No matter how small this fraction is, the photographic trace gives directly both the sine character of the wave and its frequency because it satisfies the differential equation $\frac{d^2y}{dt^2} + (2\pi\nu)^2 y = 0$. Therefore, every-day electrotechnical