rolling; we prefer our original analogy of the lubricating action of lead on a copper substrate being similar to that of a thin film of mud on a smooth road, when the area of contact between a pedestrian or motor vehicle and the road is little different from that on the dry road, while the fall in kinetic friction is a matter of common experience.

Incidentally, Dr. Schnurmann's expectation of a rise in μ followed by a further decrease after breaking through the lead film on copper is at variance with facts. Experiments show the friction to increase from $\mu = 0{\cdot}05$–$0{\cdot}08$ to μ = greater than $0{\cdot}3$ as the lead film is worn through, until as continued sliding causes copper to pick up, μ may reach a value above unity, and never decreases with further sliding.

If Dr. Schnurmann's results[8] have been incorrectly represented in a previous communication[2], one of us (T. P. H) must plead a misinterpretation of the experimental observations, which on account of their brevity were perhaps somewhat ambiguous. It is, however, difficult to see how the thermo-electric E.M.F. between pairs of sliding surfaces covered with various metal films (each metal having a different thermo-electric E.M.F.) can be considered as a certain measure of the friction μ. No doubt this point will be cleared up when Dr. Schnurmann's detailed results are published at a later date.

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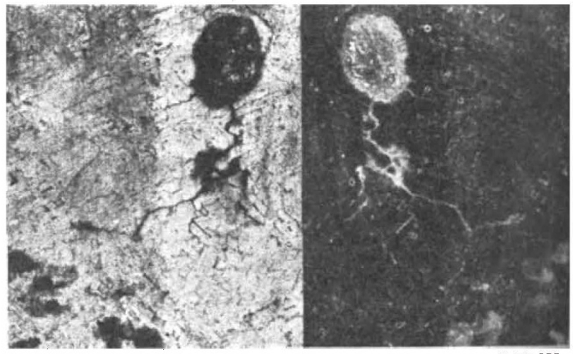
Recording Low Relief in Metallic Surfaces by Cellulose Acetate Moulds

A THIN transparent sheet of cellulose acetate, bearing on one face an accurate mould of the low relief produced in a relatively flat metal surface by abrasion, etching or impact, constitutes a useful permanent record of this relief for comparative purposes. It is superior to a photograph in being three-dimensional, but serves as a negative for photographic copies, if necessary.

Such a mould reproduces both megascopic and microscopic details with exceptional clarity. In particular, it facilitates (*a*) studies of crystalline structures revealed by polished and etched serial sections of ingots, and (*b*) investigation of the changes produced in crystalline structures of polished and etched metallic test specimens by different types of mechanical working.

Recently the method has been utilized for examining polished and etched plane sections of metallic meteorites, iron ores, steels, and brasses. Previously I employed this procedure for investigating the finer structures of rock and mineral surfaces[1]. It is allied to the collodion-mould technique of A. G. Nathorst[2], and the 'peel' technique of J. Walton[3] for studying fossil plants.



POSITIVE PRINT (RIGHT) AND ITS PAPER NEGATIVE DERIVED FROM A CELLULOSE ACETATE MOULD (LEFT) OF THE POLISHED AND ETCHED SURFACE OF A METALLIC METEORITE FROM CAÑON DIABLO, ARIZONA, U.S.A. (HUNTERIAN MUSEUM COLLECT., UNIVERSITY OF GLASGOW).
The mould was 0·08 mm. in thickness and the paper negative made on "Kodaline Slow Paper"; exposure 15 sec. at 30 in. from 100-watt lamp.

A mould is produced from a colourless or dyed dispersion of cellulose acetate in one part by volume of tetrachloroethane and two parts by volume of "Cerric Thinner T. 10" (Cellon, Ltd., Kingston-on-Thames) by (*a*) wetting the cleansed metal surface with some of the dispersing medium; (*b*) levelling and then flowing over this surface a layer of the dispersion, 1–1·5 mm. in depth; (*c*) removing the resulting cellulose acetate film from the surface when volatile parts of the dispersing medium have evaporated; that is, in eight to twelve hours after flowing the layer. Premature stripping of this film from the metal (for example, in four hours) may result in distortion of relief arising from slight shrinkage of the mould parallel to the plane of the metal surface.

This simple process yields strong transparent moulds of refractive index $N_D^{20°}$ 1·49, which are usually between 0·1 mm. and 0·2 mm. in thickness, as much as 1,200 sq. cm. or more in area, light in weight, very flexible, and insoluble in water, cold concentrated hydrofluoric acid, hot Canada balsam and xylol balsam. If such a film is to be kept for reference, its flexibility can be preserved, and ultimate shrinkage reduced, by adding to the dispersion a cellulose acetate plasticizer, such as triphenylphosphate or dimethyl-phthalate, in proportion to the percentage of cellulose acetate present.

The metallic surface is not damaged in any way by the moulding process, but any dust or parts of oxide or other detachable films are removed, and retained by the mould.

For comparison, moulds can be superposed and examined over an illuminated tracing desk. Alternatively, critical parts of them can be cut out and mounted in 'cooked' Canada balsam, for examination under the microscope at any convenient magnification up to about 500 diameters, or by optical projection.

The utility of the method is now being tested in connexion with slags, glasses, ceramic products and refractories.

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