50–100 A. in diameter, placed end to end. This observation was made previously by Farrant[14], and has since been described by other workers[10,15]. If this appearance of the fibrils does reflect an intrinsic feature of their organisation, the possibility of a smaller unit of aggregation would seem to exist.

The above investigations form part of the research programme of the Division of Forest Products and the Division of Industrial Chemistry, Commonwealth Scientific and Industrial Research Organisation, Melbourne. A full account will be given in a later publication.

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A Simple Replica Technique Suitable for the Study of Surface Structures

IN the course of some investigations on the minute cuticular hairs of certain insects[1], a replica technique was devised which, by virtue of its simplicity, may be of general interest. The medium of which these replicas were formed was a strong solution of glycerine in gelatin, obtained by steeping powdered gelatin in glycerine for some hours at 50–60° C. until homogeneous. The strength found to be most effective was about 50 per cent w/w ; but the exact amounts to be employed are probably best determined by trial, since the nature of the sample of gelatin used probably has an effect. A very small quantity of water added to the mixture was found to hasten and improve the homogenizing process ; but too much water should be avoided as it appears to reduce the quality of the replicas by rendering them too soft and plastic. The solution should normally be of such strength as to gelate at about 40–50° C., and set instantaneously below 30° C. ; when in use it is conveniently kept liquid by means of a hot-water bath.

In order to make a replica a small quantity of the medium is smeared on a microscope slide kept hot by resting it on a beaker of boiling water. The slide is then removed and the insect placed upon it, touching the gelatin medium at the required orientation while the latter is still molten ; the slide is then inverted and dowsed in cold water on the reverse side to set the medium. After 15–30 min. the insect can be removed, leaving a perfect replica of its cuticle in the now hardened medium which is readily examined under the microscope. These replicas do not normally require to be spattered or shadowed to show up the surface relief, but can be examined by transmitted, slightly oblique or dark-ground illumination. They do not shrink and last for several days, since the glycerine is non-volatile ; but they should not be squeezed or distorted, as this causes them to lose fine detail.

The great merit of the medium is its elasticity and low adhesion to organic structures, so that neither it nor the specimen is torn or damaged on separation. Even very long, thin hairs which penetrate considerably into the medium come out whole, and leave elongated holes in the replica which can be followed in optical section when examined under the microscope. Hairs which are lying actually at the interface separating the medium from the insect are to be seen in the replicas as hollows or streaks, while parts of the cuticle devoid of or sparsely covered by hairs reveal clearly a pavement-like mosaic probably representing the domains of the hypodermal cells below.

In general, it is found to be much easier to appreciate the shapes of surface structures by making a replica of this kind (remembering, of course, that the replica is inverse) than by examination under vertical or oblique illumination, because the latter method not only produces much scattered and diffracted light but also picks out reflecting or refrangible granules which confuse the overall effect of the surface contour.

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Mass Measurements on Fast Particles Ejected from Cosmic Ray Stars

DURING the careful investigation of 118 nuclear disintegrations obtained in Kodak *N.T.*4 emulsions, exposed to cosmic rays at the Jungfraujoch (3,650 m.), the identification of particles producing long tracks was attempted.

The plates were calibrated by grain-counting on twelve long tracks formed by light (215 m_e) mesons, identified as such by the decay electrons produced when they came to rest in the emulsion. We thus obtained an experimental curve dN/dR versus R/m, where dN/dR is the grain density (number of grains per 70 μ), R the residual range in microns of the particle of rest mass mc^2 and velocity $c\beta$. From a theoretical R/m versus β curve we could thus construct the curve dN/dR versus β.

If a track has sufficient length in the emulsion, we can determine the mass of the particle that produced it by two independent methods. First, we may determine the difference in grain-density between the ends of the track and see whether such a difference is expected for a meson (π) or a proton track. Secondly, measurement of the small-angle Coulomb scattering determines the quantity $P\beta$ (momentum $\times$ velocity), and, obtaining the velocity from grain-density measurements at the beginning of the track, we can determine the mass of the particle. Scattering