Petrological application of the low-power binocular microscope.

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In carrying out a petrological examination of pebbles collected by Mr. F. Gossling from the Lower Greensand of Surrey and west Kent, the writer has found a low-power dissecting binocular microscope an extremely useful piece of apparatus. The instrument, by Watson, is fitted with two pairs of objectives on a rotating nosepiece, and with two pairs of eyepieces, so that it commands the choice of four different magnifications.

The pebbles are treated in a uniform manner. After the preliminary examination of a 'bag' of pebbles, those selected for study are ground flat on one side, finishing on the fine carborundum plate as if for section making. Each one is then mounted on the usual 3 by 1 inch glass slide, taking care not to over-cook the balsam. If the pebbles are treated systematically in batches of six, a dozen pebbles can be mounted in less than an hour, so that the gain of time over section-making is very considerable.

The stage of the microscope is a large rectangle of ground glass fitted to the base of the stand; but it has been found greatly advantageous to construct a special, though very simple, fitment consisting merely of two hard-wood strips, an inch by a half, with an inch gap in between, or more if desired, to accommodate the pebble. The wood strips rest on the ground glass and are fastened together with brass strips which overlap the glass stage, thus preventing the former from slipping. The pebble-mount is clipped in position upside down, and is ready for examination through the glass on which it is mounted. For the best results it is essential to use really strong illumination. The writer uses a focusing microscope lamp by Leitz, with the beam concentrated down to give intense illumination of the polished surface.

Under these conditions oolitic cherts ('silicified oolites') and similar rocks become very beautiful and instructive objects. In the majority

of cases the matrix is clear quartz or chalcedony in which the small ooliths are packed. The latter are seen stereoscopically in full relief. Their forms and relations are apparent at a glance. As many of them are seen in section too, the shapes of the nuclei, the nature and disposition of the impurities, and the details of the internal concentric and radial structures are beautifully displayed. In experience it has been found that the stereoscopic examination of a pebble supplements considerably the information gained by study of a thin section, and has more than once corrected wrong conclusions drawn from such. One simple illustration will suffice. The thin section of a spherulitic chert shows vaguely defined spherulites which, in a very few cases, exhibit a small centrally placed opaque nucleus. The pebble-mount, however, is a fascinating object: it is transparent to quite a depth, and several 'layers' of spherulites can be seen as chains, groups, or isolated greyish orbs sufficiently translucent to show an opaque white nucleus at the centre of each without exception. Significant facts are clearly displayed, that might otherwise be deduced only with difficulty from the thin section.

In mounts of rhyolites the phenocrysts of β-quartz display their three-dimensional form to advantage; the familiar curved lines of inclusions are visible as planes, while the minute gas-filled cavities appear as brilliant points of light, and the 'corrosion inlets' as flask- or finger-like protrusions of the groundmass into the body of the crystal.

In some cases, of course, a higher magnification is required. If so, the pebble mounts can be studied quite satisfactorily under the ordinary petrological microscope, using the same strong surface illumination; or again, if a thin section also is required, it is already half made, though it is necessary to remount the pebble on stouter glass before cutting close to the smoothed surface.

The examples cited do not, of course, exhaust the list of rocks suitable for this treatment: a pebble-mount of an organic chert, for example, may be far more informative than several serial thin sections.