through the other hole in the rubber stopper, and the stopper tightly inserted into a 34 x 90 millimeter homeopathic vial E. By means of a band of thin sheet brass 1½ inch wide the vial, in the inverted position, may be neatly mounted upon a 4 x 4 inch piece of oak board, which will also support the pressure gauge of the sphygmomanometer. The board in turn is supported by a ring stand.

In assembling the completed apparatus the tube leading to the glove finger is connected with the sphygmomanometer pressure system; one tube of the brass T is connected to a compound lever tambour and the other, when provided with a short length of rubber tubing and a pinch cock, serves to control the pressure in the recording system.

The rubber finger was obtained from a Paragold rubber glove, SR702, made by the Seamless Rubber Company, New Haven, Conn. The homeopathic vial is larger than is now regularly catalogued but may be obtained upon special order. Since it is used here as regular equipment, we put it to a variety of uses. It is possible that a smaller disc may be made and a 25 x 70 millimeter vial used.

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SPECIAL ARTICLES

ZEOLITE BEDS IN THE GREEN RIVER FORMATION[1]

AT several horizons in the upper half of the Green River formation of Utah and Colorado, an extensive series of Eocene lake beds that contain large deposits of oil shale, there are thin more or less persistent beds resembling sandstone that consist almost wholly of perfect or euhedral crystals of the zeolite mineral, analcite. These crystals differ greatly in size and reach a maximum diameter of nearly 2 millimeters. All are clouded with dust-like inclusions that make them dull gray and opaque. The character of the matrix as well as the proportion of matrix to zeolites differs from bed to bed. Both these factors are significant. In general those beds with relatively few zeolites have a distinctly tuffaceous matrix consisting of silica in the form of the mineral chalcedony in which are embedded many angular fragments and elongate splinters of feldspar and quartz together with laths of biotite and euhedral crystals of orthoclase, apatite and zircon. More rarely they contain good crystals of plagioclase and either hornblende or pyroxene. Clay minerals and carbonates which make up the associated beds are virtually absent. Other zeolite beds contain a very subordinate amount of chalcedonic matrix and if transitional beds between these and the distinctly tuffaceous type had not been found their relation to volcanic ash would have been utterly obscure. In addition to the analcite most of these beds contain a few small crystals of another zeolite mineral, apophyllite. Even some of the analcite crystals contain perfect though minute crystals of apophyllite.

[1] Published by permission of the director of the U. S. Geological Survey.

In the summer of 1925 the writer found zeolite beds at one or more horizons at the following localities in Utah: about 700 feet above the base of the Green River formation in the canyon of White River, sec. 27, T. 9 S., R. 25 E., Uintah County and at approximately the same horizon in Hells Hole Canyon, sec. 22, T. 10 S., R. 25 E., also in Uintah County. One of these beds is lenticular and in places exceeds three feet in thickness. In Colorado similar beds were found at several places along White River in the western part of Rio Blanco County and in sec. 26, T. 3 S., R. 99 W., Garfield County.

Besides these crystal beds analcite occurs plentifully also disseminated in many oil shale beds of the Green River formation in Wyoming as well as in Utah and Colorado. Small apophyllite crystals too are scattered through these beds and, like the analcite, the greater number of them are euhedral. Some oil shale strata contain more than 16 per cent. by weight of analcite and others contain 1 or 2 per cent. of apophyllite. In the oil shale the zeolites are associated with numerous euhedral orthoclase crystals, angular quartz fragments and a little volcanic glass in addition to the calcium and magnesium carbonates and clay minerals that are principal constituents of most of the oil shale in this formation.

Field and microscopic study of these two types of zeolite-bearing rock indicates that both minerals formed in place on the lake bottom (or when only shallowly buried in ooze) as a result of interactions between various salts dissolved in the lake water and the dissolution products of volcanic ash that fell into the ancient Green River lakes. Presumably the volcanic material which makes up a really considerable part of the Green River formation came from Eocene volcanoes that were active in or near the San Juan Mountains in Colorado about 200 miles to the southeast.

This almost complete zeolitization of tuffs adds another interesting phase to the broader problem of the alteration of volcanic ash. Its relation to the origin of bentonite, however, is unknown for, so far as the writer is aware, the Green River formation contains no bentonite. On the other hand, it contains at least one bed of fairly fresh crystal tuff whose composition is approximately that of the igneous rock andesite. It is altogether likely that careful tracing of these tuffs and zeolite beds will demonstrate that they have an enormous lateral extent, comparable perhaps to bentonite beds. If so they would be of considerable value as precise correlative units.

As these zeolites must have formed at a temperature approximating the mean annual temperature at the earth's surface their occurrence suggests the possibility that the zeolite gels of soils may, under favorable conditions, crystallize into definite minerals. Indeed there appears to be a significant analogy between the occurrence of a natural sodium aluminum silicate gel recently described by Burgess and McGeorge[2] from the alkali soils of Arizona and this occurrence of analcite, a crystalline form of sodium aluminum silicate, in the beds of an ancient alkaline lake. Hence it seems within reason to expect that certain fossil or perhaps even recent alkali soils might contain definitely crystallized zeolites.

A more complete account of these zeolite beds together with the data which led the writer to the conclusions expressed here will be presented later in a report by the U. S. Geological Survey treating the mineralogy of the Green River formation.

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THE ADHESION OF MERCURY TO GLASS

THE adhesion of *small* drops of mercury to the clean sides of glass vessels is a matter of common laboratory observation. It is seen in partly filled bottles of mercury that have been recently shaken, and it is often noticed in the glass chambers of mercury pumps. Yet larger drops break away leaving the glass "dry."

Observations on the "wetting" of clean surfaces of glasses of special constitution, as evidenced by the *rise* of the mercury meniscus against such surfaces when vertical, have been reported by Schumacher.[1] The observations reported here are of a totally different sort. The glass is that of ordinary laboratory lenses—probably crown glass as the index of refraction in each case was between 1.53 and 1.56. These were cleaned by rubbing the surfaces with a piece of absorbent cotton wet with absolute alcohol. The mercury was singly distilled, and to lessen contamination was transferred from vessel to vessel through a glass siphon that was started by a current of dry air. Before each set of observations the mercury was passed through a paper and cottonwool filter to free it from dust caught on its surface. The observations were made in the open air of the laboratory, so it will be evident that no claim for extreme cleanness of surfaces can be made.

If the surface of a glass lens, cleaned as described above, be brought into contact with a pool of mercury so that the lowest point (the apex) of the glass is say 0.2 mm. below the level of the mercury surface, the air adherent to the glass depresses the mercury in contact with it and holds it out of contact with the glass. After an interval, which may vary from a fraction of a second to several minutes, the fluid pressure seems to drive the air away from the apex of the lens and then, in a flash, a bright mirror spreads over the glass. This may be interrupted by a few small bubbles of imprisoned air. The edge of the mirror surface, or the "circle of extreme contact" of mercury and glass, is well above the general level of the mercury pool—a meniscus being formed at the edge of which the mercury is lifted a millimeter or more. As no reference to this phenomenon could be found in the literature available it was thought worth while to make some quantitative observations on it.

The disposition of apparatus is shown diagrammatically in fig. 1. A is the pool of mercury—about 18 cm

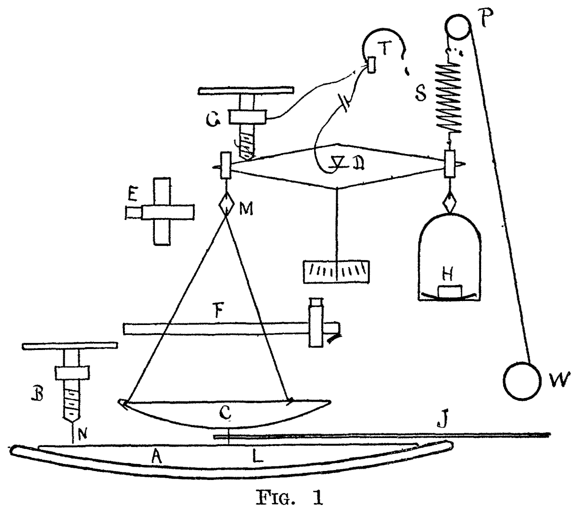

FIG. 1

across—in its shallow glass basin, B is a micrometer screw on a fixed stand by which the needle point N may be adjusted to contact with the surface of the mercury pool, and by means of which changes in the level of A may be followed. C is the lens of measured curvature, the lower surface of which is under observation. The lens is held in a frame of steel wires

[2] Burgess, P. S., and McGeorge, W. T., Zeolite formation in soils. SCIENCE, new ser., vol. 64, pp. 652–653, 1926.

[1] *Jour. Amer. Chem. Soc.* Vol. 45, No. 10.