PLOTTING OF CRYSTAL ZONES ON A SPHERE. John M. Blake. *Am. J. Sci.*, [4] **43**, 237–242, 1917.

The crystal zones are plotted upon a 30-cm. sphere and the unknown elements are obtained graphically with the aid of a gnomonic projection. In many cases, especially when founded on uncertain measurements, the more difficult algebraic solutions are no more accurate than those obtained by graphical methods. C. B. S., W. F. H.

EFFECT OF SURFACE TENSION ON CRYSTALLINE FORM. Cecil H. Desch. Royal Techn. Coll., Glasgow. *Chem. Met. Eng.*, **21** (15), 773–776, 1919; abstract reprinted by permission from *Chem. Abstr.* **14** (4), 372, 1920.

According to the hypothesis of Quincke, metals and other substances before solidifying from the liquid state separate into 2 immiscible liquids, one much smaller in amount than the other. These liquids exhibit surface tension and form a foam, the one in smaller amount constituting the cell-walls, the other the cell-fillings. The cell walls should be represented in the solid mass by the boundaries of the crystal grains; and if the original hypothesis is correct, the grains in a solid metal should approximate in shape the cells in a foam. From the principles determining the stability of foam structures, especially the number of films which meet in a point and the most favorable angles, it would be predicted that this is essentially a tetrakaidecahedron; this is a cubo-octahedron, with all the edges equal, 6 of the faces squares, and 8 regular hexagons. To possess minimum area, the faces of this would be concave, bounded by nearly circular arcs of 19° 28′. By examn. of a foam obtained by blowing air thru a liquid, it was found that actually 5-sided faces were by far the most frequent, 4 and 6 about equal, but much less frequent, and other numbers of rare occurrence; the form of the cells thus most often approaches that of the regular pentagonal dodecahedron, (also with curved edges) a form the angles of which do not deviate greatly from the theoretically most favorable ones. If the hypothesis were wrong, and crystn. were not affected by surface tension, the crystals should form around equidistant nuclei, and the dominant forms of the crystals be either rhombic dodecahedrons, if the packing were cubic, or the quadrilateral-faced dodecahedrons of hexagonal packing. To test the matter out, β-brass containing some aluminium was treated with mercury whereupon the grains separated and their faces could be counted. Their average shape agreed almost exactly with that of the foam described above, confirming the correctness of the original hypothesis. Near boundaries both foam and metal—in this case an ingot of crucible steel—showed as would be predicted more 6-sided faces. An attempt was made to approach the matter also from the cross-sections of the polyhedrons concerned, but this did not give satisfactory results.

Evidently 2 forces are competing in the formation of crystals, cohesion—the force of crystallization—and surface tension. Which of these is dominant depends on many factors, such as the nature of the substance, compn. of the mother liquor, dimensions of the mass, temp., etc. When the mass is small, the surface forces are most important. Metals with marked power of orientation tend to form interlocking grains. Ice, as in glaciers, is a good example of the latter relation. E. T. W.