

imations to the more complex ratios really existing. These, from the frequent impurities of natural silicates, can seldom be fixed with exactness, although with sufficient precision to give very nearly the values of P and V, which latter serves to determine the place of the species in the natural system of classification. Water being an element universally distributed in nature, its presence or absence in a silicate becomes of subordinate importance in determining alike the genesis and the natural affinities of species. Hence the water-ratios are omitted in the tables of classification, wherein the various natural silicates are from the chemical side, considered with regard to the atomic ratios of the fixed bases to each other and to silica.

There are genetic reasons (which were explained at length) for separating silicates of sesquioxys-bases, like alumina, from protoxyd-silicates. The former of these constitute the Persilicates, and the latter the Protosilicates, those containing both protoxyds and sesquioxys being designated Protopersilicates. Ferric oxyd and zirconia are classed with alumina, while titanite and boric oxyds in silicates are counted with the silica in determining the atomic ratios.

In the table of the Protosilicates, and in that of the Persilicates, both hydrous and anhydrous, the generally accepted atomic ratios of the fixed bases to the silica are noted, but in the table of the Protopersilicates regard is had to the more important ratios of the sesquioxys and fixed protoxyd bases to each other, inasmuch as the ratio of the silica to both of these is found to vary greatly in closely related species, as may be seen in zeolites, feldspars, scapolites and micas. In these tables the three groups of silicates are arranged with primary reference to physical characters. Thus for Protosilicates we have in parallel vertical columns Pectolitoid, Spathoid, Adamantoid, Phylloid and Ophitoid, for each of which the range of values for V is given, while in an adjacent column are inscribed the approximate atomic ratios of fixed protoxyds to silica. Among pectolitoids are included with pectolite, apophyllite and datolite, hydrorhodonite, diopside, pyrosmalite, calamine, cerite and thorite. The spathoids embrace tephroite, willemite, gadolinite, helvite, leucophanite, tscheffkinite and wollastonite; the adamantoids, chondrodite, chrysolite, phenacite, bertrandite, hornblende, pyroxene, titanite,