

in other words, the proportion between the alkalies and the alumina, will depend not only upon the age of the formation, but upon the number of times which its materials have been broken up, and the periods during which they have remained unmetamorphosed, and exposed to the action of infiltrating waters. Thus for example, that portion of the Lower Silurian rocks in Canada which became metamorphosed before the close of the palæozoic period, will have lost less of its soluble bases than the portion of the same age which still remains in the form of unaltered shales and sandstones. Of these again, such parts as remain undisturbed by folds and dislocations, will retain a larger portion of bases than those strata in which such disturbances have favored the formation of mineral springs; which even now are active in removing soluble matters from these rocks. The crystalline Lower Silurian rocks in Canada may be compared with those of the older Laurentian series on the one hand, and with the Upper Silurian or Devonian on the other; but when these are to be compared with the crystalline strata of secondary or tertiary age in the Alps, it cannot be determined whether the sediments of which these were formed, (and which may be supposed, for illustration, to have been directly derived from palæozoic strata), existed up to the time of their translation, in a condition similar to that of the altered, or of the unaltered Lower Silurian rocks of Canada. The proportion between the alkalies and the alumina in the argillaceous sediments of any given formation is not therefore in direct relation to its age; but indicates the extent to which these sediments have been subjected to the influences of water, carbonic acid, and vegetation. If however it may be assumed that this action, other things being equal, has on the whole, been proportionate to the newness of the formation, it is evident that the chemical and mineralogical composition of different systems of rocks must vary with their antiquity; and it now remains to find in their comparative study a guide to their respective ages.

It will be evident that silicious deposits, and chemical precipitates, like the carbonates and silicates of lime and magnesia, may exist with similar characters in the geological formations of any age; not only forming beds apart, but mingled with the impermeable silico-aluminous sediments of mechanical origin. Inasmuch as the chemical agencies giving rise to these compounds were then most active, they may be expected in greatest abundance in the rocks of the earlier periods. In the case of the per-