THE PERIODIC LAW.

Copper, silver, and gold are not so closely related to each other as are the metals of the alkalis. Still they have many points of resemblance. They are heavy, durable metals difficult to oxidise, and therefore valuable in the arts and manufactures. Each of them forms a white chloride of the type MCl (CuCl, AgCl, AuCl), insoluble in water but soluble in ammonia solution. They also form basic oxides of the same type, viz.; Cn₂O, Ag₂O, and Au₂O. But copper forms compounds of another type, CuO, etc. These capric compounds are in some cases isomorphous with the corresponding compounds of iron and zinc. Thus copper forms a connecting link between the first and second series of this long period. Gold forms an acid oxide, An₂O₂, Auric acid, HAuO₄, is a weak acid, but forms crystallisable salts of the alkali metals. These with chlorauric acid, HAuCl₁, and its salts recall similar compounds of boron and aluminum. These compounds of copper and gold are examples of many similar cases in which elements of one group have a distinct resemblance to those of another. In fact, it follows from the gradation in properties both in the series and in the groups, that each element must bear a resemblance more or less close to the four elements next it in the family and the series to which it belongs. But apart from this there are apparently irregular likenesses, as that of thallium to the alkali metals, of chronium to aluminum, and of titanium to iron. Indeed, the periodie law places manganese in the same group with the halogens with which it has very few affinities, and separates it from iron, nickel, and cobalt which it resembles much more; so that for practical purposes (for chemical analysis, etc.) this classification needs to be considerably modi-

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