

Chemistry has attained to such a degree of perfection that the analyst can now determine the composition of the various vegetable, animal, and mineral substances which he meets, with an extreme degree of accuracy. In many instances, he can do this in two ways. He can always separate the elements which exist in a compound, and ascertain their relative quantity; and this is called *analysis*. And sometimes he can take those elements and cause them to unite, so as to form a particular compound; and this is called *synthesis*. By these methods he has ascertained that, amid the vast variety of substances in nature, there are only about sixty-four which cannot be reduced to a more simple form, and are therefore called *elements*, or simple substances. Now, the chemist finds that, when these elements unite to form compounds, certain fixed laws are invariably followed. They combine in definite quantities, which are always the same, or some multiple of the same weight; so that each element has its peculiar and invariable combining-weight; and it cannot be made to combine in any other proportion. You may mix two or more elements together in any proportion, but it is only a certain definite quantity of each that will combine, while the rest will remain in excess. Hence the same compound substance, from whatever part of the world it comes, or under however diverse circumstances produced, consists of the same ingredients in the same proportion. These laws are followed with mathematical precision, and we have reason to believe that the same compound substance, produced in different parts of the world, never differs in its composition by the smallest conceivable particle. Indeed, with the exception of the planetary motions and chrystallography, chemical combination is the most perfect example of practical mathematics to be found in nature.

Such are the laws which the chemist finds invariably to regulate all the changes that now take place in the constitution of bodies. What evidence is there that the same laws have ever prevailed? In the rocks we have chemical compounds, produced in all ages of the world's history, since fire and water began to form solid masses. Now, these may be, and have been, analyzed; and the same laws of definite proportion in the ingredients, which now operate, are found to have controlled their formation. The oldest granite and gneiss, which must have been the earliest rocks produced, are just as invariable in