with his means of allaying pain and fever, of regulating many physiological functions, of neutralising bacterial poisons, and of determining the death of the parasites of disease. Already the chemical manufacture of pharmacologically active substances constitutes one of the vital activities of modern civilisation. But the application of chemical science to physiology and medicine is in its earliest infancy, though it will lead in time to advances as yet undreamt of. For further progress we require a finer and more subtle analysis of those wonderful chemical and physico-chemical changes which preserve the mobile and dynamic equilibrium of living matter.

The problem of life, of living matter, forms one of the great goals of chemical science, on the slow and progressive solution of which depend our future existence and well-being. At the other end of the long chain of evolution lies the problem of the birth of matter. This is perhaps the other great goal of chemical science. It is a very long way from the shining nebula to the speck of protoplasm. There are many who would dig an impassable ditch in this long road.

But however that may be, the question of the synthesis and possible reconstruction of what we call our material world is one of truly transcendant importance. The discovery that the atoms of matter can, and in certain instances actually do, break up into other atoms and into electricity we owe to the genius of French and British science, and the first recognisable transmutation was discovered at University College, London, by Sir William Ramsay and Prof. Soddy. So tremendous, however, are the forces in operation during these changes that hitherto it has proved impossible to control them in any wise. I might perhaps mention that we owe to Sir William Ramsay and to Prof. Norman Collie the first determined and courageous attempts to begin this battle of the giants. We find ourselves here in a new world of chemical and molecular science. We are the spectators of forces and velocities hitherto undreamt of. But the progress of electrical science, which has ever been the fairy godmother of chemistry, gives us reason to be of good courage.

Already we know that electricity, which is but a finer form of matter, is a component of the atom. We know from the researches of von Laue and of Prof. Bragg and his son that the excessively short electric waves sent out by certain forms of electrical discharge, the so-called X- or Röntgen-rays, can penetrate and analyse the exceedingly fine-grained atomic structure of a crystal. Is it too much to hope that still shorter and denser electric waves, sent out by the most powerful sources, may be able some day to penetrate the very core and nucleus of the atom and disturb the potent equilibrium that reigns therein?

The researches of astronomers, chemists, and physicists have shown that in the gaseous nebulæ and the early stars matter exists in forms as yet unknown to us on our planet, and that as the progress of stellar evolution proceeds we gradually arrive at stars akin in nature and composition to our sun and our own world. Is it too much to hope that we may so succeed in employing electricity and electrical energy as synthetic reagents that we shall eventually, and indeed perhaps at no distant date, arrive at the production of these simple and primary forms of nebulous matter? Whether these problems will admit of solution in the near or the distant future, or whether, indeed, some of those which I have mentioned will ultimately defy all our efforts, it is here that I would ask you to seek the profound *rôle* which chemical science is destined to play in civilisation.

EVOLUTION AND SYMMETRY[1]

In the animal kingdom two dominant types of body symmetry are to be found. In animals that are sedentary or floating in habit the symmetry is frequently radial, but in animals that are free and move rapidly by their own muscular activity the symmetry is bilateral. In those classes of animals now sedentary in habit, which by their developmental history show a descent from a previously free and bilaterally symmetrical ancestry, a secondary radial symmetry is usually found either in the form of the body or in the arrangement of the organs for the capture of food. Similarly in the Echinodermata some examples are found, particularly in the class Holothuroidea, of animals descended from a sedentary and radially symmetrical ancestry assuming with their freedom and increased muscular activity a secondary bilateral symmetry.

In the groups of animals that are radially symmetrical, whether sedentary or floating in habit, there is usually a far greater range of variability than in those that are bilaterally symmetrical, and in the endeavour to classify them into genera and species on the Linnean system the zoologist finds so many cases of overlapping and fusion that some doubt arises as to the existence in Nature of discontinuous specific groups.

In the order of the sea-pens there is a complete series of forms connecting the radially symmetrical colonies of the genera Veretillum and Cavernularia with the bilaterally symmetrical genera Pennatula and Pterœides. In this series the difference between the range of variation in the radially symmetrical genera and that in the bilaterally symmetrical genera is very pronounced.

In such characters as the size of the zooids, the size and shape of the spicules, and the length of the axis, remarkable variations are found in the radially symmetrical genera. In the bilaterally symmetrical genera these characters are far more definitely fixed, and can usually be relied upon for determination of species.

Having examined a large number of specimens of the Pennatulacea collected by the *Siboga* expedition and in other collections in this country and abroad, the author believes that in some of the radially symmetrical genera there is no such discontinuity of structure as would justify their division into specific groups. In the bilaterally symmetrical genera, on the other hand, the existence of definite specific groups is certain. If this view is justified, the conclusion would be reached that the evolution of those discontinuous groups of specimens which are commonly recognised as species is correlated with the change from a radially symmetrical to a bilateral symmetry of the body.

The evidence at present at our disposal points very definitely to the conclusion that the radially symmetrical sea-pens are more primitive than the bilaterally symmetrical sea-pens, and evidence is produced which suggests that the former are derived from an Alcyonacean ancestry which assumed a floating or drifting habit.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

GLASGOW.—The degrees conferred on Commemoration Day, June 26, included the following:—Doctor of Laws (*honoris causâ*), Dr. J. Ferguson, emeritus professor of chemistry; Doctor of Letters, W. H. Dunn, thesis, "The Development of English Biography"; Doctor of Science, Alex. Scott, thesis, "Con-

[1] Summary of the Croonian Lecture on "Evolution and Symmetry in the Order of the Sea-pens," delivered before the Royal Society on June 22 by Prof. S. J. Hickson, F.R.S.