

account of the phenomena observable on the outer shell of a cooling world, duly considered in all their relations, and fully co-ordinated with all the chief results of all elder and younger sister sciences.

The battle of uniformitarianism itself, however, was but a passing episode in the great evolutionary movement. That movement began along several distinct lines toward the close of the previous century, and only at last consciously recognized its own informing unity of purpose some thirty-five years ago. From another point of view—in connection with its influence upon thought at large—the evolutionary crisis has been treated elsewhere in this review by a philosophic thinker; but in its purely scientific aspect it must also be briefly considered here, forming, as it does, the acknowledged mainspring of all living and active contemporary science.

Evolution is not synonymous with Darwinism. The whole immensely exceeds the part. Darwinism forms but a small chapter in the history of a far vaster and more comprehensive movement of the human mind. In its astronomical development evolution had already formulated itself with perfect distinctness before the period with which we have here specially to deal. The nebular theory of Kant and Laplace was the first attempt to withdraw the genesis of the cosmos from the vicious circle of metaphysical reasoning, and to account for it by the continuous action of physical and natural principles alone. Our own age has done much to cast doubt upon the unessential details of Kant's rough conception, but, in return, it has made clearer than ever the fundamental truth of its central idea—the idea that stars, and suns, and solar systems consist of materials once more diffusely spread out through space and now aggregated around certain fixed and definite nuclei by the gravitative force inherent in their atoms and masses. As these masses or atoms drew closer

together in union around the common center, their primitive potential energy of separation (frankly to employ the terminology of our own time) was changed, first into the kinetic energy of molar motion in the act of union, and then into the kinetic energy of molecular motion or heat, as they clashed with one another in bodily impact around the central core. Each star, thus produced, forever gathers in materials from its own outlying mass, or from meteoric bodies, upon its solidifying nucleus, and forever radiates off its store of associated energy to the hypothetical surrounding ether. The fullest expression of this profound cosmical conception has been given in our own time by Tait and Balfour Stewart, working in part upon the previous results of Kant, Laplace, the Herschels, Mayer, Joule, Clerk Maxwell, and Sir William Thomson. Deeply altered as the nebular hypothesis has been by the modern doctrine of correlation and conservation of energies, and by modern researches into the nature of comets, meteors, and the sun's envelopes, it still remains in its ultimate essence the original theory of Kant and Laplace.

Science has thus, within the period of our own half-century, exhibited to us the existing phase of the universe at large in the light of an episode in a single infinite and picturable drama, setting out long since from a definite beginning, and tending slowly to a definite end. Other phases, inconceivable to us, may or may not possibly have preceded it; yet others, equally inconceivable, may or may not possibly follow. But as realizable to ourselves, within our existing limitations, the physical universe now reveals itself as starting in a remote past from a diffuse and perhaps nebulous condition, in which all the matter, reduced to a state of extreme tenuity, occupied immeasurably wide areas of space, while all the energy existed only in the potential form as separation of atoms or molecules; and the evidence leads us to look for