

SOME UNDISCOVERED TRUTHS IN GEOLOGY.

At the recent meeting of the American Association, for the advancement of science, held in the city of Montreal, Canada, the President, Dr. J. W. Dawson, of Montreal, addressed the body on "Some Undiscovered Truths of Geology." We copy the following synopsis of the doctor's address from the *Scientific American*:

In such a wide sweep we need not be surprised to learn that there are yet some unsolved problems. We are met at the outset with an inquiry as to man's place in the nature he is to study. His organism is certainly a part of nature, and he is the terminal link of a long chain of being. As a scientific animal, man finds within himself a mind more potent than matter, and that reacts on nature. We recognize this difficulty when we divide science into experimental and observational. It does little good to meet mysteries by guesses, nor should we on the other hand resign ourselves to ignorance. We must wrestle with the unsolved questions of nature, mastering what we can, and leaving others to be grappled with by our successors. In proceeding to mark out the terms of ascertained knowledge, the speaker began with the oldest rocks, a formation of immense thickness, and corresponding to what used to be called fundamental granite. He intimated his belief that this was deposited as gneiss from a shoreless ocean. The Lower Laurentian rocks probably limit our progress backward, beyond which lie only physical hypotheses as to a cooling incandescent globe. Ascending, we meet with significant changes. Beds of limestone are associated with the beds of gneiss. Gravel beds show the existence of shores; and graphite informs us of some sort of plant life, and iron ores of organic matters. In the Middle Laurentian appeared the *Eozoon Canadense*, probably the oldest form of life of which we have any knowledge. Metamorphism next came into play. Nothing in geology perishes. Heat may change clays into slates, and limestone into marbles; but nothing wholly disappears. A great battle rages over the genealogy of the rocks, the steps of which Dr. Dawson sets forth, claiming that the sudden incoming of life in varied forms baffled biologists and furnished an unsolved problem. The theories of evolution are insufficient to account for it. The process still is as mysterious as ever, and a great gap is left in our accumulated knowledge.

Suppose that we start, however, with a number of organisms ready made; we ask, how can these have varied so as to give us new species? It is a singular allusion that variation may be boundless, aimless and fortuitous, and that development arises from spontaneous selection. Varieties must have causes, and the vast and orderly succession of nature must be regulated by fixed laws, only a few of which are yet known to us. One consideration showing how imperfect are our attempts to reach the true causes of genera and species, is the remarkable fixity of leading types. Trace certain forms of life along their own line through stupendous vicissitudes and across the ages, and you find them substantially unchanged. Examples are the foliage and fructification of mosses, the venation of wings of insects, the structure and form of snails; all of which were settled in the carboniferous age.

Huxley holds that there are but two possible alter-

natives as to the origin of species viz: 1. Mechanical construction. 2. Evolution. But we know that instead of two there are numerous possible methods, such as absolute creation, mediate creation, critical evolution, and gradual evolution. The origin of whales affords an example of the difficulties arising from referring existing forms to imaginary ancestors. Gaudry, though a strong evolutionist, candidly says: "We have questioned these strange and gigantic sovereigns of the tertiary oceans, and they leave us without a reply."

The periods of rapid introductions of new forms of life were not periods of struggle for existence, but of expansion; while the real periods of struggle were marked by depauperation and extinction.

Another unsolved problem is the inability of paleontology to fill the gaps in the chain of being. Many lines of being present a continuous chain. On the other hand, the abrupt and simultaneous appearance of new types in many specific and generic forms, over wide areas, obliges evolutionists to assume periods of exceptional activity alternating with stagnation—a doctrine scarcely differing from the old theory of special creation. Plainly a vast amount of conscientious work is needed to account for these breaks in the chain.

Another mystery yet unexplained is the causes of the great movements of the earth's crust by which mountains and plains and ocean beds have been formed. It is known, however, that much is due to the unequal settling of the earth towards its center, and also to the pressure of the ocean against the shore. Complex movements of plication are more easily comprehended than the regular pulsations of flat continental areas, each change being accompanied by changes of climate, plants and animals.

The problems as to coal formations the ancient fucoids or algae and as to the great and much debated glacial period, next received attention. What caused the great climatic changes that have occurred during geologic time? How came there to be a vast continental glacier reaching as far south as the 40th degree of latitude and thousands of feet thick? Shall we not after all to give up this favorite theory? May not many of the phenomena be explained by supposing a glacial sea with Arctic currents and icebergs wafted southward are due to local glaciers? It may also be questioned if glaciers are not relatively protective rather than erosive agencies, and if sufficient importance has been attached to their work in leveling and filling old hills and channels. Still another question is as to how long a time has elapsed since the glacial era. Recently the opinion has been gaining ground that its cessation dates back only 6,000 or 7,000 years. This problem, of course carries with it the question of the origin and early history of man.

The practical inference is that we are but newcomers on this earth, and have had but little time to solve such great problems. Geology is young, scarcely a century old. We are surprised that so many regard it as a complete and full grown science. Humility, hard work, and abstinence from hasty generalizations should characterize geologists for at least a few generations to come. Science is light, and light is good. Let us raise it high enough to shine over obstruction that casts any shadow on the true interests of humanity. Above all, let us hold up the light and not stand in it ourselves.