pillar of white marble, on which was carved the figure of a bull. It was, doubtless, this figure which caused the tomb to be regarded as that of St. Luke. It certainly, however, is Christian, and goes back to the first centuries of the faith, though hardly to the apostolic age.

When the valley once widens out toward the east, we find ourselves among the extensive ruins of a gymnasium and on the site of the Magnesian Gate. It was from this spot that the Sacred Way led round the eastern slope of Mount Prion and away to the great Temple, and it was by the same path that I galloped off to the hill which looks down upon Ephesus and went in old days by the name of Selmissus. The ruins of the Turkish castle on its summit adjoin also the ruins of two mosques—one of Saracenic origin, commonly known as the Mosque of the Sultan Selim, and the other an early Christian church. It was in this church, if we may listen to tradition, that the Council of Ephesus which condemned Nestorius was held, and there seems every reason for believing that in this case tradition is correct. Here, too, St. John was said to have been buried, and even now, on the anniversary of his festival, a mysterious dust arises from his sepulcher, possessed of healing virtues. More interesting to the visitor, however, than this doubtful place of pilgrimage and its still more doubtful miracle are the gigantic granite columns from the Temple of Diana, which stand in the roofless Mosque of the Sultan Selim. Their companions are preserved in the Mosque of S. Sophia, at Constantinople. The Mosque of the Sultan Selim is a very interesting one, as its architecture is Saracenic or Moorish, and its great size and the fragments of ornamentation which may still be seen here and there upon the walls show that its Mohammedan builders must have possessed at once power and taste. It is strange that so much uncertainty exists as to who they were.

The road from Ephesus to Miletus lies through the ruins of Magnesia and Priene, each famous among the students of ancient architecture. Miletus itself can boast of no such attractions as those which still remain on the sites of its sister cities. The sea has retired from its ruined walls, the Mæander falls into the bay several miles from its ancient mouth, and the port is a fever-stricken plain. The scanty remains that mark the site are all of the Roman period, and with the exception of the vast theater, built on the level ground, and not cut out of the side of a hill, as elsewhere, there is nothing of interest among them. The situation, however, cannot be touched or spoilt by the hand of time or man, and for the stranger, who remembers the past history and glories of Miletus, to see the situation is amends enough for all the fatigues and dangers of travel. Better, however, even than to stand on the spot itself is the view over it commanded by the mountain-range which ends in the storied promontory of Mykale. I climbed one of the hights called Thorax in Greek days, and now known to the Turks as the Silver Mountain, and thence looked down upon the vast Mæandrian plain which lay below me. Through it the Mæander wound in billowy curves to the sea, receiving its tribute of streams, which nurture the famous fig-gardens of the plains. At my feet were the ruins of Magnesia, of Priene, and of Miletus, and far away in the distance the relics of the ancient oracle of Branchidæ. In front rose the five summits of Latmos, where Endymion was wooed by Artemis, and behind them towered the white peaks of Halicarnassus, the birthplace of "the father of history." To the right stretched the blue sea and the shores of Samos, while the little isle of Patmos showed itself on the furthest horizon. The scene was at once varied and beautiful, bathed in the golden light of an eastern sun and quickened by the memories of a glorious past. Though the ridge on which I stood was a very nest of brigands, and the plain below had witnessed a conflict between them and a band of soldiers but a day or two before, it was impossible to remember danger or aught else in the midst of such a scene. I have seen many views of surpassing beauty, many which are hallowed by the associations of classic history: but never have I seen any which may compare with that which I enjoyed from the summit of the Silver Mountain.

OXFORD UNIVERSITY, ENGLAND.

BARON VON MÜNCHAUSEN, at Jerusalem, has been able to obtain very little more information respecting the statue of Gaza than we have recently reported from our own correspondent. He estimates its hight to be thirteen feet, and learns that the lower portion of the right arm is broken off. The Pasha of Jerusalem was claiming the object for the Imperial Museum at Constantinople and endeavoring to send it there; but no means of transportation thither had appeared to further his designs, and at last accounts the prospect that the colossus would lie a long while at its place of discovery was a very good one.

Science.

THE LAW OF EVOLUTION.

BY PROFESSOR A. S. PACKARD, JR.

THE theory of descent, or evolution, is an attempt to account for the origin of the different forms of life by the operation of hidden processes whose results are apparent to us—*i. e.*, the so-called secondary laws or modes of operation of what we call Nature. There are about one hundred thousand species of plants now living, and perhaps three or four times as many animals. They have been preceded by as many or more similar organic forms. From early times philosophic minds have speculated as to the mode of origin of these myriad forms. Have they been created just as we find them instantaneously, by what has been called a "fiat" of the Almighty, or has the process of origination been left by the Creator to natural law? We now are in a better position than twenty or fifty years ago to arrive at some definite conclusions in regard to the matter. All scientists are agreed that the universe, with its solar systems, has had a beginning, a consecutive history; that the earth itself has had a history; that long periods or ages of preparation, succeeded by critical epochs, have finally rendered it fitted for the abode of the assemblage of organic forms constituting its present flora and fauna; that its continents and oceans have been differentiated; and that, hand in hand with this differentiation and special elaboration of the grand land masses, the gradual formation of mountain chains, plateaus, lowlands, rivers, systems have given rise to distinct climates and varied meteorological conditions; that each region of the earth has its peculiar and distinct floral and faunal assemblages; and that there is a general harmony between the earth and its inhabitants. The study of fossils shows that the oscillations of land, the changes in the relative amount of land and water, has led in many cases to the wholesale extinction of life, followed by the appearance of new forms. Not that the world generally or at any one point was rendered destitute of life; but that the change was gradually of such a nature that, if a human being had been there to witness the change, things would seem to be going on much as at the present day, for within the memory of man numerous birds and mammals have become extinct. Moreover, the succession of life in geological times has been orderly and along certain lines. Most of the Palæozoic or oldest forms were of two categories. Some were simple and specialized, but the most were generalized forms, combining with characters *sui generis;* others which became elaborated and more completely carried out in more recent types. They were old-fashioned, prophetic types, useful in their day and generation; but which became replaced by new styles of organisms, more specialized, with their different organs more highly wrought out. For example, the Palæozoic fishes were all generalized types. Since the beginning of the chalk period the bony fishes, numbering 10,000 recent and perhaps nearly as many fossil species, have appeared. Besides this, the majority (we do not know of any notable exception) of naturalists believe that man has existed all the way from 10,000 to 100,000 or more years upon the earth; that he was at first a savage and afterward became civilized.

Thus far we have been dealing with matters of fact, capable of demonstration, concerning which experts, the best judges, are agreed. All agree that the solar system was evolved, that the earth was evolved; all agree that, as the theory of gravitation lies at the basis of solar physics, so the nebular hypothesis is necessary to account for the origin of our earth. Now, the question arises as to whether plants and animals share in this process of evolution. Nobody denies that there were successive steps in the progress of the earth—for example, different stages or arenas for the habitation of life-forms; and, while all grant that continents and ocean-basins have been gradually formed, many illogically deny that the different and successive assemblages of organisms peopling these successive arenas were produced by the working of biological laws, such as transmission by genetic descent, heredity, growth-force, etc.

There are at present two classes of minds: (1) those who believe in the evolution of organic life by natural processes, of a piece with physical, chemical, astronomical, and geological laws; and (2) those who believe that solar systems, planets, continents, eclipses, trade-winds, tornadoes, and rain-storms, and all other natural phenomena, are the result of secondary law, but insist that the mode of origination of the species of plants and animals was directly opposed to all this, and that they were suddenly produced by what is called a process of special creation. In short, they believe in evolution by direct, immediate creation. The first class embraces the large majority of experts, scientists, those who have studied the phenomena of Nature as the occupation of their life; while to the second class belongs a few scientists who can be counted on the fingers, plus a large number of the most cultivated, thoughtful minds, not, however, trained in the methods of scientific thought, and the rest of mankind, who believe as they are taught and never do their own thinking.

The science of biology is as yet in its infancy. Within thirty years a great advance has taken place in our knowledge of species and their distribution and the succession of fossil forms. Strange and unexpected revelations of connecting links between families, orders, and even classes of plants and animals have been made. The improvements wrought in the microscope have enabled naturalists to accumulate an immense mass of facts regarding the lowlier forms of life and concerning the mode of development of animals. The habits of animals and plants and the relation to their surroundings have been zealously observed; so that the time is ripe—has, in fact, already come—when theories as to the mode of origin of species and the more general categories are demanded and have been presented, in a more or less crude shape, as mental instruments of research, as tools to work with, certainly not dogmas to be slavishly followed.

As we have stated in our "Zoölogy":

"The nature of the evidence tending to prove that species have originated through the agency of physical and biological laws is mainly circumstantial, there being comparatively few facts in demonstration of the theory, the direct act of transformation of one species into another under the eye of scientific experts having never (unless we make two or three exceptions) been observed.

"Reasoning *à priori*, we assume that organisms, both plant and animal, have been created by development from pre-existent forms, because it agrees with the general course of Nature. All the events in geology, as in physics and astronomy, being due to the operation of natural laws, it is reasonably supposed that the production of all the species of plants and animals from original simple forms, like the Monera or Bacteria, have been the result of the action of natural law. The study of the early forms of life found in the Palæozoic strata; the laws of the succession of types; the correlation existing between the development of the individual and of the members of the class to which it belongs; the parallelism between the formation and differentiation of the land masses of the globe and the successive extinctions and creations of plants and animals—all these facts, notwithstanding the imperfections of the geological record and the fact that many of the older forms of animals were nearly as much specialized as those now living, tend strongly to prove that, on the whole, the world as it now exists has been the result of progressive development, one form coming genetically from another, the animal and plant worlds constituting two systems of blood relations, rather than sets of independent creations.

"When to more special studies of those species which live in extraordinary environments—such as cave animals, parasitic animals, brine-inhabiting animals, Alpine forms, and certain deep-sea species—we add the study of rudimentary organs in adult animals, of temporary, deciduous organs in young or larval animals; when we compare the metamorphoses of some species congeneric with others, which undergo no transformations; when we study the delicate balance in Nature, as observed in the geographical distribution of animals; the harmony in Nature between species and their environment; protective coloration and resemblance in form, the relations between carnivorous and herbivorous creatures, the struggle for existence between animals, we are forced to acknowledge that the operations of Nature, as a whole, tend, on the one hand, to the origination of new forms and the preservation of those which are useful, or, in other words, are in harmony with their surroundings; and, on the other hand, to the destruction of those which are incapacitated by changes in their environment for existence in what has been and now is a constantly changing, progressive world.

"Again, reasoning by induction, as an actual fact, we know that species vary; that hardly any two experts agree exactly as to the limitation of species;* that varieties tend to break up into races, and that no two individuals of a race are exactly alike. Where the climate and soil remain the same, the species tends to remain fixed and stable. Remove the stability in the environment, or subject the individuals of a species to changes of soil and temperature, and expose it more than usual to the attacks of its natural enemies, it then begins to undergo a change. This is seen in those individuals of a species which live on the borders of lowlands and highlands, of deserts and fertile tracts, of salt and brackish water, of shallow and deep water, and of polar and temperate zones, or to the influence of alternating cold and warm weather. When, as in some cases, climatic or other agencies suddenly change, we may have species and even genera suddenly appearing, as is known to be the case in the change of one genus to another of brine-shrimps when the water changes from brackish to a brine, as worked out by Schmankevitch, in Russia.

"The struggle for existence resulting in the survival of the fittest is a fact now generally observed. . . .

"Lastly, the variation in domestic animals, the result of the subjection of the species to influences not felt in what we call a state of nature, is an indication that animals not exposed to human interference may vary when subjected to changes in their environment."

These and many other facts and reasonable inferences indicate that, by the operation of natural, secondary laws, races and species have been evolved which have followed constantly improving lines of development, the outcome of which are creatures the best fitted to withstand the struggle for existence, the most useful in the scheme of Nature (for the world evidently has not evolved itself, but is the result of the operations of divine power and will), and the most in harmony with the world about them. There has been progress from the simple to the complex, from the lower to the higher, from evil to good. The whole outcome of evolution is from the imperfect to the perfect; a constant improvement of the world and its inhabitants. The very idea of evolution implies optimism and points to the Infinite Goodness, whose will evolves order and system out of chaotic, unorganized matter. The plant and animal world teem with examples of admirable, wonderful design. The argument for teleology is to some evolutionists overwhelming, and the time will arise when a second Paley, in the light of the law of evolution, will write a new natural theology. To our minds, the ultra-materialistic idea that the universe is self-evolved is as unphilosophical and unworthy of modern science as the mediæval dogma that plants and animals were suddenly created "out of nothing."

The scientific objections to the theory of evolution are: the imperfections of the geological record; the gaps between existing forms; and the want of demonstration of the transformation, *under the eye of experts*, of one species to another, of one genus to another; together with the cases of alternations of generations and certain anomalies in the distribution of species. These are weighty. More light is needed; but the discoveries of each year are closing the gaps, rendering more perfect the geological record. Experts claim to have seen several species produced, and the cases of parthenogenetic reproduction are probably extremes of a series of phenomena which can be explained by the laws of all growth. As explaining an immense and varied mass of facts before undigested, as an instrument of research, as a stimulus to discovery, the theory in its present crude form has made an epoch in the advance of human knowledge, and added, as it were, a new element to our philosophic sense.

BROWN UNIVERSITY.

*As one of many examples, we may cite the fact that fifty-nine nominal species of the squirrels have been described as inhabiting tropical America; but lately the number has been reduced to twelve.

Fine Arts.

THE worst sufferer by the recent fire in Boston was probably the Heliotype Printing Company, of which Mr. J. R. Osgood is manager. It lost the accumulated material of a business of seven years' growth, including large collections of tools and apparatus used in the printing of its works of art, and twenty-five thousand negatives, out of which it did not save five dollars' worth. The process of heliotype printing was first brought to the United States by Mr. James R. Osgood, of this Company, who secured the patents and the services of the inventor in 1872. The first pictures offered for sale were views and a map of the burnt district in Boston of 1872. The first pictures offered after the establishment is set up again are views of the new burnt district, the upper floors of all of which were occupied by the Company. The reproduction of some 200 or 300 of the leading subjects of the "Gray Collection of Engravings" was the first serious effort toward making the process an art educator, and, whatever may have been the failings of some of these crude impressions, they were, without doubt, very successful as a means of art education. A desire for a better knowledge of the higher branches of art in engraving was engendered, which to-day can be traced in many important directions. The success of this publication induced Messrs. Osgood & Company to follow out the same line in other directions, and their efforts have resulted in the issuing of a large catalogue of art works, which have met with great success and favor. Among them may be mentioned the works of Titian, Dürer, Correggio, Raphael, Landseer, Millais, the great composers, the great artists, and hosts of others, the last notable work being Darley's illustrations to Hawthorne's "Scarlet Letter," of which one edition had been sold at Christmas and another was in preparation at the time of the fire. Concurrently with the art publications, the Company was producing a similar series of scientific subjects, to the order mostly of government and state institutions, as well as a large number of publishers. Among this series were Woodward's "Medical and Surgical History of the War"; Lieut. Wheeler's "Annual Reports"; "The State Geological Survey of New