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CONTENTS.

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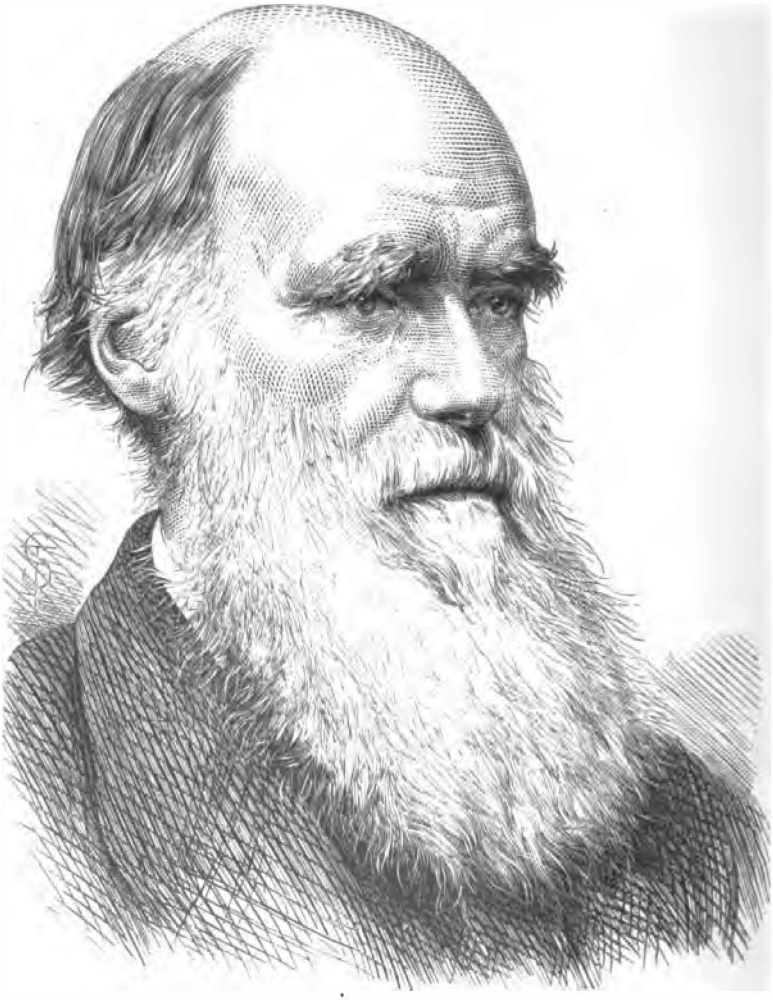
SKETCH OF CHARLES R. DARWIN, LL.D.

MR. DARWIN died at his home, Down House, near Orpington, England, April 19th. He had been suffering for some time from weakness of the heart, but continued to work till the last. He was taken ill, after having enjoyed an apparent improvement, on the day before his death, with pains in the chest, faintness, and nausea, from which he never recovered.

Mr. Darwin inherited his scientific tastes from two successive generations of ancestors, and has transmitted them to some of his children. His grandfather, Dr. Erasmus Darwin, was a distinguished botanist, and was the author of a poem "The Botanic Garden," the merits of which are decidedly more botanical than poetical, but which has a plâce in English literature; and of the "Zoönomia, or the Laws of Organic Life," a work in which the theory of development was plainly foreshadowed. His father, Dr. Robert Waring Darwin, was a Fellow of the Royal Society. His grandfather on the mother's side was the celebrated Josiah Wedgwood, whose name is intimately associated with the Wedgwood earthenware.

CHARLES ROBERT DARWIN was born in Shrewsbury, England, February 12, 1809, and received a preparatory education at the grammar-school of that place, under the head-mastership of Dr. Samuel Butler, author of one of the old standard text-books on geography, and afterward Bishop of Litchfield and Coventry. He entered the University of Edinburgh when sixteen years old, and two years later, in 1827, went to Christ's College, Cambridge, whence he was graduated Bachelor of Arts four years afterward. The most that is known definitely of his special pursuits at these institutions is that at Edinburgh he gave some attention to marine zoölogy, and read his first scientific paper, "On the Movement of the Ova of Frustra" before the Plinian Society, and that at Cambridge he was especially interested in botany.

His Majesty's ships Adventure and Beagle had returned in 1830 from a four years' survey of the coasts of Patagonia and Terra del Fuego. Captain Fitzroy, of the Beagle, had gained so much credit by his efficiency as an officer and the value of the observations he recorded, that he easily obtained a commission to return to the South American waters on another and more extensive exploring expedition. Before going he made a public offer to give up a part of his own cabin to any competent naturalist who would accompany him. Darwin saw the notice, and at once offered his services without salary, on the condition that he should be given the disposition of his collections. He was accepted, and thus obtained, when twenty-two years old, "what would be considered a prize by any naturalist of double his age." The expedition, with Darwin as one of its members, sailed on the 27th of Novem-



CHARLES DARWIN, M. A., F. R. S., Etc.

ber, 1831, and was gone four years and ten months, during which time it visited Brazil, Patagonia, Chili, Peru, the Galapagos and Society Islands, New Zealand, Australia, Mauritius, St. Helena, and the Cape Verd Islands. The observations taken during this voyage and the previous expedition were published by Captains King and Fitzroy, their commanders, in a voluminous report, to which Mr. Darwin contributed a volume embodying "A Journal of Researches into the Geology and Natural History of the Various Countries visited by his Majesty's Ship Beagle, under the Command of Captain Fitzroy, from 1832 to 1836." Of this work Sir Charles Lyell wrote to the author, in September, 1838, before it was actually published: "I assure you my father is quite enthusiastic about your journal, which he is reading, and he agrees with me that it would have had a great sale if separately published. The other day he told me that he wished to get a copy bound the moment it was out, and send it as a present to Sir William Hooker, who, more than any one, would be delighted with yours. He was disappointed at hearing that it was to be fettered by the other volumes, for, although he should equally buy it, he feared so many of the public would be checked from doing so." The volume was published separately in 1845. The ten years which followed Mr. Darwin's return to England were mainly devoted by him to the publication of the numerous and important results that had been obtained during the voyage. He edited the treatises of Professor Owen, Mr. Waterhouse, Mr. Gould, the Rev. J. Jenyns, and Mr. Bell, on the different groups of vertebrate animals as "The Zoölogy of the Voyage of H. M. S. Beagle"; and he wrote three separate volumes embodying further fruits of his observations than he had given in the "Report," "On the Structure and Distribution of Coral Reefs" (1842); "Geologic Observations on Volcanic Islands" (1844); and "Geological Observations on South America" (1846). Of the first three works, a reviewer of the second edition in "Nature," in 1874, says: "The rising generation of naturalists and geologists have not had, and most probably will never have, such feelings of intellectual pleasure as fell to the lot of the readers of Charles Darwin's book on 'Coral Reefs,' which was offered to science more than thirty years ago. The recent researches into the nature of the deposits of the deep-sea, and the discoveries of bathymetrical zones of water of very different temperatures, are certainly full of vast interest, and will afford the data for the development of many a theory; but the clear exposition of facts, and the bold theory which characterized the book on 'Coral Reefs,' came unexpectedly and with overpowering force of conviction. The natural history of a zoophyte was brought into connection with the grandest phenomena of the globe—with the progressive subsidence of more or less submerged mountains, and with the distribution of volcanic foci." And this reviewer adds that "even at this period of Darwin's life the importance of the struggle for existence had been recognized by him, and had in-

fluenced his thoughts. He remarks that he 'can understand the gradation only as a prolonged struggle against unfavorable conditions.'" The President of the Geological Society has said that, "looking at the general mass of Mr. Darwin's results, I can not help considering his voyage around the world as one of the most important events for geology which has occurred for many years." Professor John W. Judd, noticing the works of this series in a group, said, in 1877, "Students of Mr. Darwin's earlier geological writings must all have been impressed by the powers of minute observation, the acumen in testing, and the skill in grouping data, and the boldness and originality in generalization which distinguished their author; for these characteristics are no less distinguished in the theory of coral reefs than in that of natural selection"; and "these 'Geological Observations' are well worthy to take their place in the long series of the author's contributions to the doctrine of descent side by side with those more widely known works on different departments of zoölogy and botany which have been published subsequently to the 'Origin of Species.'"

His most important work on zoölogy, "A Monograph of the Family Cirripedia," was published by the Ray Society, 1851 to 1853. It gave accurate determinations of every recognized species of the animals known as barnacles and sea-acorns; and was shortly afterward followed by another monograph on the fossil species of the same family, which was brought out by the Philosophical Society. All of these works—each of which was, as the estimates we have quoted indicate, of the first importance in itself, and each of which is a standard to this day—were but as preliminaries to the culminating achievement of Mr. Darwin's life, the exposition of the doctrine of the origin of species and development by natural selection, as given in the series of works on "The Origin of Species by Means of Natural Selection; or, the Preservation of Favored Races in the Struggle for Life" (1859); "The Variations of Plants and Animals under Domestication" (1867), and "The Descent of Man and Selection in Relation to Sex" (1871); and in the numerous special works in which he has made various particular phenomena of animal and vegetable life illustrate and re-enforce his great doctrine. The views expressed and defined in these works, although, now that they have "come of age," they have sensibly and profoundly affected the whole world of thought, were a surprise. Scientific men received them hesitatingly or with incredulity; those who were not scientific with displeasure. Yet they were not wholly novel; for Aristotle, Goethe, Mr. Darwin's grandfather, and others, had suggested similar hypotheses, and Mr. Wallace had independently reached conclusions very like those enunciated by Mr. Darwin. They have had to make their way against the prepossessions of the minds to whom they appealed, and against the prejudices which those prepossessions awakened when they were assailed.

Gradually the theory of descent gained acceptance among the

scientific thinkers of England, with whom the proportion of those ready to deny it grows less from year to year. In Germany it became, in the course of ten years, more or less completely accepted by those best qualified to judge, and was the occasion of the production of a considerable literature of arguments and facts in its favor, without encountering any very serious opposition. In France, the truth of the theory was far less extensively admitted, and it continued to be, for many years, the object of a vigorous and often bitter opposition, the echoes of which have hardly yet died away. A prolonged discussion took place in the French Academy of Sciences relative to the merits of the author of the theory in 1870, when Mr. Darwin was nominated to fill the vacancy in the zoölogical section caused by the death of M. Purkinge. M. Milne-Edwards first spoke in his favor, saying that, while he was himself absolutely opposed to evolutional doctrines, he rendered homage to the value of the special works of Mr. Darwin, especially to the theory of the formation of coral islands. M. Elie de Beaumont added his testimony to the value of this theory, and remarked that Mr. Darwin had done good work which he had spoiled by dangerous and unfounded speculations; he should not be elected until he had renounced them. M. Emile Blanchard was very severe upon Mr. Darwin for an hour, styling him an "intelligent amateur"; and M. Elie de Beaumont interpolated that his work was the "froth of science." M. de Quatrefages replied to M. Blanchard, saying that there were two men included in Mr. Darwin, a naturalist observer and a theoretical thinker: the naturalist is exact, sagacious, and patient; the thinker is original and penetrating, often just, sometimes too rash. That the theory with which his name is connected, that of natural selection, has in it something seductive and plausible, is shown by its having been worked out by such men as Darwin, Wallace, and Naudin, laboring independently and in different paths. If the ideas and the works of Darwin are such as some of his opponents represent, how can they have obtained the support, in less than ten years, of such men as Lyell, Hooker, Huxley, Karl Vogt, Lubbock, Haeckel, Filippi, and Brandt himself, who has just been elected correspondent in opposition to Mr. Darwin? Then, having enumerated Mr. Darwin's works in geology, comprising seven real contributions to the science, and in zoölogy, his works on the origin of species and variation, and particularly his investigations of the strange variations in fowls, pigeons, and rabbits, M. de Quatrefages summed up by saying: "Mr. Darwin is an eminent naturalist, who wishes to remove from science the invocation of the first cause, and to seek the explanation of the natural facts of the organic world in secondary causes, as was done long ago in geology, chemistry, and physics. But he goes no further; and we ought not to judge Darwin by the words of a few disciples who seem never to have read his works. It would be unjust to make him responsible for the exaggerations and

aberrations of those who take refuge under his name." M. Robin made an argument which presents a singular appearance now, in view of the hosts of minute but important facts which Mr. Darwin has showered upon science since it was made, that, in respect of demonstrable facts which he had introduced, there would be a hundred zoölogists who should have precedence over him. If from his publications "we eliminate the views, neither the reality nor falseness of which is demonstrable, and which are therefore not objects of science, there remains to him a share of titles which is inferior to that represented by the well-demonstrated scientific data introduced by M. Bischoff; there remain to him even fewer titles to our suffrages than to any of the *savants* who are placed on an equality with him in our list of presentations." Mr. Darwin was not elected. His name came before the Academy again, on a nomination to be a foreign correspondent, in 1872, and received the same support and the same opposition as two years before. He was rejected—receiving only fifteen votes, to thirty-two cast for Mr. Loewen, of Stockholm. His time came at last to receive the recognition of French men of science. He was elected a corresponding foreign member in the zoölogical section in 1878, by a vote of twenty-six to fourteen, after a rapid change in his favor, and three years after having received a similar recognition from the Imperial Academy of Science of Vienna. On the occasion of his sixty-ninth birthday, in 1877, he received, as a testimonial from Germany, an elegant album, containing the photographs of one hundred and fifty-four men of science in that country, addressed "To the Reformer of Natural History, Charles Darwin," and a similar album containing the photographs of two hundred and seventeen distinguished professors and lovers of science in the Netherlands, accompanied with an account of the progress of opinion in that country with respect to evolution, as a proof which, it expressed, "we are persuaded, can not but afford you some satisfaction that the seeds by you so liberally strewed have also fallen on fertile soil in the Netherlands." Mr. Darwin replied to the latter testimonial modestly, acknowledging his obligations to previous observers of facts, and adding: "I suppose that every worker at science occasionally feels depressed, and doubts whether what he has published has been worth the labor which it has cost him; but for the remaining years of my life, whenever I want cheering, I will look at the portraits of my distinguished co-workers in the field of science, and remember their generous sympathy." In 1877 the University of Cambridge, amid circumstances of great enthusiasm, conferred the degree of LL. D. on him in a Latin oration, in which his work was neatly summarized, and which closed, "Thou, also, who hast so learnedly illustrated the laws of nature, be our doctor of laws." A subscription was afterward inaugurated at Cambridge for the erection of a permanent memorial of him, which it was agreed should be a picture, to be painted by Mr. W. M. Richmond.

Mr. Darwin's later works, besides those which we have already named, which are for the most part monographs embodying facts and researches into the manner in which different functions of animals and plants are developed, include "The Various Contrivances by which Orchids are fertilized by Insects" (1862); "The Movements and Habits of Climbing Plants" (1865); "The Expression of the Emotions in Man and Animals" (1872); "Insectivorous Plants" (1875); "The Effects of Cross and Self Fertilization in the Vegetable Kingdom" (1876); "The Different Forms of Flowers and Plants of the Same Species" (1877); "The Power of Movement in Plants" (1881); "The Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits" (1882). All of these works have been received with interest by the public, and have been fully noticed in our pages. The works which have been called forth by the influence of Mr. Darwin's writings are catalogued in a German pamphlet of thirty-six octavo pages, containing the names of three hundred and twelve authors.

Mr. Darwin was subject to frequent sudden attacks of illness which laid him prostrate for days together. The periods of convalescence were made useful for observations requiring almost constant attention; and such observations, made in the sick-room, are referred to in his "Climbing Plants." His tastes were almost wholly scientific. For sculpture or pottery, or even for drawing, except as an aid to botanical and zoölogical pursuits, he cared very little, his collection of pictures being confined to a portrait of old Dr. Darwin and one of Josiah Wedgwood, hanging in his dining-room, and sketches of Sir Joseph Hooker and Professor Huxley in his study.

Commenting on Mr. Darwin's methods of investigation and presentation, "Nature" remarks in a review of one of his books, that, in turning over its pages, "one is almost distracted from the intrinsic interest of the facts and speculations by the sagacity with which the research is carried on, and the skill with which the results are marshaled for our information. It is peculiarly worthy of notice . . . how the reader is allowed, in studying Mr. Darwin's pages, to form his own hypothesis in explanation of the facts, only to be compelled, in due course, as the narrative proceeds, to admit that such hypotheses are utterly untenable." Scientific candor is mentioned as one of his prominent qualities by Mr. J. W. Judd, who says that, "like his teacher and friend, the late Sir Charles Lyell, he never forgets in his discussions to look at all sides of the questions before him, and to give the fullest expression and weight, alike to the difficulties which he himself detects, and to arguments which opponents may have advanced." This quality is well illustrated in the successive editions of the "Origin of Species," where the author's changes or modifications of views in particular points are frequently acknowledged and recorded.

EDITOR'S TABLE.

CHARLES ROBERT DARWIN.

THE present year will be memorable in the history of science as bringing to a close the labors of two illustrious scientific thinkers—one, perhaps, the most eminent man of science in America, Dr. John William Draper, and the other probably the most celebrated scientific man of the world at the present time, Dr. Charles Robert Darwin. Both men had accomplished their work, the former dying at the age of seventy-one, and the latter at the age of seventy-three; and it is remarkable that both were among the most distinguished representatives of the same school of progressive scientific thought. Their names will be for ever associated with that great revolution of ideas for which all modern science has prepared, but which has been accomplished only within the present generation. Both men made large and important contributions, by observation and experiment, to the departments of science which they respectively cultivated, but they will be measured in future chiefly by the bearing of their work upon the great intellectual movement of the period.

Everybody knows what we mean in speaking of the movement of thought with which the names of Draper and Darwin are identified; and which we have referred to as a revolution of ideas already accomplished. One of its leading aspects is the application of the scientific method to the phenomena of life in order to explain their changes by natural causes. Mr. Darwin's name has been so closely associated with this extension of scientific method to cover the origin of the diversities of living beings upon earth that he has come to be a representative of the idea; while the term "Darwinism" has been vaguely employed to stand for the doctrine. The twenty volumes of "The Popular Science Monthly" bear uniform and abundant record that "Darwinism" has been generally accepted as true in the world of science for the last ten years. But there is a sharper test of the change of opinion that has taken place than any affirmation regarding the verdicts of scientific men. At its earliest promulgation "Darwinism" was denounced by the whole body of religious authorities as false and execrable. There was never such unanimity in the pulpit as was displayed in cursing the new apostle of the doctrine of man's descent from an ancestry of inferior animals. The devil got a considerable respite while the batteries were all being turned upon Darwin as the arch-enemy and subverter of all religion. But, as the movement of ideas went on all the same, common sense began to assert itself in various quarters, so that there has latterly been more temperateness of condemnation, and even a readiness to accept the long-detested doctrine as probably true, and by no means so bad as it at first seemed. And, now that Darwin is dead, there is a universal burst of admiration for the man, accompanied by abundant admissions that his ideas are true; and he is laid in Westminster Abbey alongside of Newton, while the most eminent preachers of London agree in declaring that there has been nothing in his teaching that is not wholly consistent with the soundest Christian belief. Canon Liddon, of St. Paul's, author of "The Divinity of our Lord and Saviour Jesus Christ," is reported to have said in a sermon that "Mr. Darwin's theories are not necessarily hostile to the fundamental truths of religion"; and Canon Barry, author of "Orthodox Commentaries on Portions of the Bi-

ble," declared that "the doctrine of evolution lent itself as readily to promises of God as less complete explanations of the universe."

To explain the world-wide fame of Mr. Darwin and the expressions of high appreciation that have been elicited by his death, several circumstances must be taken into account. In the first place, his pre-eminence as a naturalist is not for a moment to be questioned. He had a genius for investigation in this field, as is shown by the immense amount of valuable and original work that he has accomplished. As an accurate and indefatigable observer, of keen insight, and equally fertile and skillful in his experimental devices to bring out the secrets of Nature, he was probably without a rival. Descended from a race of naturalists, he seemed to have a constitutional intuition for penetrating the mysteries of living beings, and detecting subtilties that had eluded previous observers. Patient, industrious, and concentrated upon his work, he has enriched natural history with a multitude of new facts, which will make his name an authority for all future time.

But Mr. Darwin was more than a mere observer and accumulator of facts; he was a man of ideas capable of methodizing his observations and making them tributary to the progress of theoretical views. He found the problem of the origin of the diversities of living beings unsettled, he subordinated all his researches to its solution, and he put forth a theory upon the subject that has made him famous. This was the principle of natural selection, called also the survival of the fittest, and it was elaborated with a wealth of illustration that rapidly commended it to the acceptance of the scientific world. In a nutshell it is this: There is a law of heredity, or descent of traits, from generation to generation, in the kingdom of organic life—a law under which "like produces like." But there is also a law of variation by which like always produces the slightly unlike—a modification from generation to generation, and adaptation to ever-changing conditions. At the same time the rate of multiplication gives rise to a destructive struggle for existence, in which multitudes perish and but comparatively few survive, while the survivors are those best fitted to the new conditions. In this way new characters are strengthened and developed, and old traits are weakened and disappear, so that the progress of life is at the same time a slow transformation, in which at first new varieties and then new species gradually arise by minute increments of change. Thus the diversities among living creatures are accounted for by the operation of natural agencies.

But, besides the intrinsic character of his work, the traits of the man were eminently calculated to produce the most favorable impression. He was not a controversialist, and, instead of going roughly athwart men's prejudices, he was kindly, considerate, and conciliatory in all his writings. He was also modest and eminently candid and fair-minded, always seeking to do justice to the views of his opponents. Men felt that his supreme object was simply to get at the truth. For this he labored incessantly and untiringly, and thus won the respect of all who can appreciate sincerity of aim and elevation of purpose. Added to this he was a very genial and pleasant man in his personal relations, and most highly regarded by those who were honored with his acquaintance and friendship.

But still other elements must be taken into account in explaining the extent of his popularity. He was a remarkably fortunate man. We refer not so much to his easy circumstances, which gave him command of resources and allowed full consecration to a life of study; but we mean that he came at a great crisis of thought, when a lead-

er was wanted in a comprehensive scientific field. It was his happy fortune to avail himself of a previous advance of biological inquiry, which was much greater than is generally supposed. Mr. Darwin has himself fully pointed out to what various extents his idea of natural selection had been discerned by preceding naturalists. It was a discovery all ready to be made, and how inevitably it grew out of the state of knowledge that had been attained, and how imminent it was in the thought of the time, is shown by the fact that he was compelled to publish on the subject earlier than he had intended, to prevent being anticipated by Mr. Alfred Russel Wallace, who had already arrived at and worked out the same principle. It was fortunate for the fame of Mr. Darwin that Mr. Wallace so gracefully and generously stepped aside, and surrendered to him the full leadership of the new biological reform.

Nor is it to be forgotten, in enumerating the causes that have conspired to give such prominence to the name and fame of Darwin, that his subject was one of intense and universal interest. No matter how unpalatable were the theories proposed, everybody was concerned with questions of the origin of life, because they involved explanations of human origin. Whence we came has always been a riddle which there has been an irrepressible curiosity to solve. Mr. Darwin's explanation came in the name of science, and, apparently involving but a single principle of such simplicity and familiar illustration that everybody could understand it, his little book was sought for and read with avidity by all classes. And yet, in the nature of things, it was impossible that the work should be generally understood with any thoroughness. It dealt with an order of ideas for which our higher education made no preparation, so that the college graduate was little better equipped than the uneducated country farmer to read intelligently and appreciatingly the argument of the "Origin of Species." There was, consequently, a great deal of popular confusion and misapprehension as to what Mr. Darwin had really done, and which naturally led to erroneous and even extravagant claims as to the nature and scope of his work. To those who were not well instructed he came to be regarded as the creator of an epoch and the originator of the whole scheme of ideas connected with his investigations. We see this in the tendency to attribute to Mr. Darwin the fatherhood of the law of evolution, and to identify evolution with Darwinism. He contributed to that universal law a most important principle, but he was neither its founder nor did he ever attempt anything like its general exposition. That great doctrine had been overwhelmingly proved, had been resolved into its forces, formulated, and extensively applied to the reorganization of scientific knowledge, before Mr. Darwin had ever published a word upon the subject. He has done noble work, and his position is for ever assured among the greatest in science; and, if circumstances have tended to favor some exaggeration of his real claims, we may leave to time the correction of imperfect judgments, and the equitable award of all honors among those to whom honors are due.

A VERY MODERN REPROACH.

COMMENTING, two months ago, upon Goldwin Smith's article attacking scientific ethics, we pointed out the extensive co-existence of supernatural beliefs with a lax morality. The "Christian Union," under the title of "A Very Ancient Reproach," charges "The Popular Science Review" with reviving a stale old accusation of Thomas Paine. It, moreover, attempts to confound us with "History," and offers a quotation from Gibbon, declaring that through conversions by the early Church "the