

Two chapters are given to the study of the 'limitations of the steam-engine,' a phrase of somewhat awkward form rhetorically, but which is familiar to all engineers interested in the subject as relating to the limits set to the efficiency of the machine by the counteracting influences of 'cylinder condensation,'—another awkward phrase, meaning condensation of steam in the steam-cylinder, —and of conduction and radiation or other forms of waste which distinguish the actual from the ideal engine. Here the author takes the hitherto unconquered bull by the horns, and gains the honor of having been the first to produce a rational formula embodying what are supposed to be the laws of this method of transmission of heat, and of loss of engine efficiency due to it. The resulting expression is somewhat complicated; but it is justified by experiment, so far as comparison has been carried by its author, and may be expected to stand until further progress is made in investigation of the actual conditions,—which are unquestionably far from being few or uninvolved,—and extended research shall have thrown more light upon a problem which is to-day the most important in the whole theory of the steam-engine.

Space does not permit the criticism in detail of this or of any other part of the book. It is rich in valuable material, and although, like the angels, not absolutely without fault, in the opinion of well-informed engineers, either in matter or in manner, deserves exceptionally high praise for its wealth of excellences.

The Ancient Cities of the New World. By DÉsirÉ CHARNAY. New York, Harper. 8°.

IN the present volume Désiré Charnay gives the results of his long and careful explorations in Central America, which were begun in 1857. Since that time, all his energies have been directed towards the collection and preservation of the antiquities of that country. As the expenses of his expeditions were defrayed in part by the French Government, in part by an American citizen, Mr. P. Lorillard, his collections are deposited in the Trocadero in Paris, and in Washington: they are indispensable for all future studies of the culture of ancient Central America. The book under review is as well pleasant to read—describing, as it does, the travels of the author and the present state of the country—as of scientific value, giving the results of his studies, and showing in numerous splendid illustrations the ancient monuments and other kinds of relics, as well as beautiful views and characteristic groups.

It was the main object of the expedition with which the author was intrusted to collect authentic material for a thorough study of the ancient civilization of Central America: therefore his studies were almost exclusively directed to the collecting of relics, photographing of buildings and reliefs, and making casts of the inscriptions and bas-reliefs. The material he gives in this line cannot be excelled. His researches lead him to the conclusion that the American civilization at the time of the conquest was of comparatively recent origin. It is his opinion that all its branches bear the characteristics of Toltec civilization, and that, by studying the monuments, the migrations and the gradual development of Toltec art may be discovered. A map shows the author's opinion regarding the subject. He lets the prehistoric Toltecs immigrate from the north-west. From the plateau of the City of Mexico two branches emigrated,—the Gulf branch and the Pacific branch. Subdivisions of the former invaded Yucatan. He lets the two principal divisions meet in Copan, the south-eastern terminus of their migrations. "The Toltecs," he says, "migrated south, following the coasts of both oceans. They ceased to exist as a nation after the disruption of their empire; but their scattered remnants carried on the work of civilization in Central America, on the high plateaus, and in Anahuac, evidenced in the strong resemblance that the civilizations of these various regions bear to one another." The time of the erection of the largest buildings and temples he supposes to be about the twelfth century.

We cannot accept those theories of the author referring to the connection between the art of eastern Asia and Central America. A thorough and detailed comparison has never been made, and superficial similarities of monuments and customs cannot be a sufficient proof of a common origin.

Since the present volume was written, the author has accomplished a new journey to his favorite field of explorations, a pre-

liminary report of which is being published in *Le Tour du Monde* and in the *Globus*. The recent enterprise of this devoted explorer has not been less successful than the former ones, some results of which are fortunately made accessible in the volume just published.

Living Lights. By CHARLES FREDERICK HOLDER. New York, Scribner. 12°.

MR. HOLDER has thrown into a popular form the substance of what is known about phosphorescent animals, illuminated by occasional coruscations of imagination. Most of his readers will be surprised to learn that the power of emitting light is so widely shared by animals of all classes. Not only do fire-flies fly, glow-worms glow, and zoöphytes twinkle in the sea, but sea-anemones, alcyonarians, gorgonias, star-fishes, earth-worms, crabs, shell-fish, lizards, frogs, toads, fishes, birds, monkeys, and men must be added, according to Mr. Holder, to the number of animals capable of giving forth light. In the author's preface, he says, "In the United States there are ten thousand enrolled young naturalists, comprising the Agassiz Association. As one of a committee solicited to answer questions propounded by the young people, . . . I have often been surprised at the nature of the queries, which shows that this army of young observers includes many who are not merely collectors of curiosities, but are naturalists in the best sense. They are systematic inquirers, and working in the right direction to become scientists, should they continue. It is to these young scientists . . . that this volume is addressed." While we welcome any book that will serve to awaken in the young an earnest desire to study nature, and while this fascinating volume will certainly awaken interest, it is all the more to be regretted that the author is so fond of pyrotechnical natural history. He loves to hear the sigh of pleasurable surprise that rises from his audience as he sets off a pyrosomatic rocket, or kindles pavonian flame. This fault appears especially in the illustrations, which, for young people, should be accurate, since from them they derive their lasting impressions. Not to rely on our own judgment, we quote the author's own words, "It is evident that illustrations of the phosphorescence of marine animals must be more or less conjectural;" and again (the Italics are ours), "In Plate XXVII. [XXVI.?] an *ideal* view is given of the *possible* appearance of the light of a large heron." There is no excuse for 'conjectural illustrations' and 'ideal views of possible appearances' in a book of this nature. They are distinctly misleading and wrong, and have the obvious and inevitable effect of throwing discredit on some of the more highly-colored portions of the text, into which the phosphorescence of herons, lizards, monkeys, and men seems to have been admitted on very slender evidence. Those portions of the book which record the results of Mr. Holder's own observations are the most interesting, and perhaps the least illuminated by fancy.

The Ventilation and Warming of School-Buildings. By GILBERT B. MORRISON. New York, Appleton. 8°.

IT seems a long leap from Rosenkranz's 'Philosophy of Education,' which opened the International Education Series, to this successor, which discusses practical schoolhouse-building. But Dr. Harris shows how catholic his conception of education is by including the two books in the same series.

Mr. Morrison truly says that no "subject has been more carefully and intelligently studied than the direct and ultimate effects of impure air on the human system, and on no subject is there more unanimity of competent opinion" (p. 18); but nevertheless the want of sufficient and definite information regarding the ventilation of schoolhouses is general. The lack of general information on this particular point is the more blameworthy, inasmuch as the effects of breathing impure air are not only pathological, but pedagogical and economic. The author instances this (p. 22).

A short chapter deals succinctly with the physical aspects of the air, and then the various tests for its examination are briefly described. The general theory of ventilation is illustrated by a simple experiment (p. 47); and then the natural and artificial methods of ventilation are discussed with more attention to detail. The remaining chapters discuss the general problems of ventilating and heating, and include descriptions of many of the expedients that are used for these purposes. The treatment of each question is abreast

of the times, and eminently satisfactory; and, if the book is referred to half as frequently as it should be, our schoolhouses will be healthier and better adapted to serve the purpose for which they are erected.

Azimuth. A Treatise on this Subject. By JOSEPH EDGAR CRAIG. New York, Wiley. 4°.

THE determination of azimuth comes up as an important practical problem on board ship, in ascertaining the variation or deviation of the compass, or on land in fixing a true meridian line, and it is desirable that the necessary astronomical observations should be made under conditions which give, at least theoretically, the most accurate results attainable. Lieutenant-Commander Craig's book is a mathematical study of the spherical triangle with respect to the azimuth problem, supplementing the text-books, and he calls attention to certain statements in the latter on some points referring to the most favorable conditions of observation, which he regards as misleading.

After devoting several pages to the elementary formulæ for the solution of a spherical triangle, and the differential variations of its parts, he considers the conditions of maximum and minimum errors, and the most favorable and least favorable position of a heavenly body for observation in a given latitude. Two-thirds of the text are then taken up with an analysis of the equations to the loci of maximum and minimum errors, and the book concludes with some thirty plates illustrating these loci.

The Ethical Import of Darwinism. By JACOB GOULD SCHURMAN. New York.

THE excitement following the appearance of Darwin's works rendered a fair criticism of their merit and import impossible. The younger generation, who had been trained to some extent to think by the methods of which Darwin forms a model, were ready for the announcement, and were at once transformed into a body of enthusiastic followers. The older thinkers, and especially such as were by their profession devoted to upholding a theory of the universe established by tradition, and in entire opposition to the discoveries of science, met the new theory with violent protestations of inconsistency with established beliefs, and denounced it as fraught with danger to morality and the religious sentiment. It is only within a few years that the smoke has been lifted off the battle-field, and made it possible to calmly contemplate the justness and the outcome of the battle. As has frequently happened before, it is found that the party who asked, not "Is it true?" but "What does it lead to?" has been the loser. The general point of view of which Darwinism is an expression, the ingenious and valuable explanations which that master-hand collected, the healthy ferment penetrating through all departments of knowledge that his writing brought about,—all these have become the inalienable inheritance of mankind. On the other hand, the majority of evolutionists will admit that their doctrines have been regarded as solving certain vexed problems of mankind which really remain as unsolved as ever; and the province and exclusiveness of the mechanism of development which Darwin discovered have been likewise exaggerated. Recent writers, such as Romanes, are acknowledging the former and supplementing the latter. The one has been termed a 'pseudo-Darwinism,' and in addition to natural selection we speak of 'physiological selection,' and so on.

Professor Schurman's book gives every mark of having been written in the latter half of this decade. There is no attempt to dwarf or warp (much less ridicule) the evolutionary position: on the contrary, its strictly scientific character is appreciated, and its main tenets admirably sketched. Contrary to the usual method in such discussions, the author has taken the trouble to find out what Darwinism is. Nor do these negative virtues complete the list of the merits of the book. The author practically illustrates, by a vigorous and intelligible style, his opinion that "there is no theory, or criticism, or system (not even Kant's or Hegel's), that cannot be clearly expressed in a language which in Locke's hands was strong and homely, in Berkeley's rich and subtle, in Hume's easy, graceful, and finished, and in all three alike plain, transparent, and unmistakable." Moreover, each chapter is devoted to the expression of a real point without irrelevant matter or needless repetition. The

several chapters form a logical train of argument, and the book is thus worthy of the attention of the scientist. The unfortunate fact that so many works in this field are strikingly deficient in all these qualities makes it necessary to signalize the exceptional character of this work.

Professor Schurman holds that 'evolution' is a strictly scientific hypothesis warranted by facts, and is to be accepted, whether for the sake of argument or as a real belief, by all who seek to determine its ethical import. He denies that the system of utilitarian hedonism which Darwin and Darwinists have attached to the theory is at all a legitimate inference from that theory, and regards it as accidental, and due to the fact that these men were raised in this school of ethics. Darwinism is to him consistent with any theory of ethics, and does not favor one above another. As long as evolution simply explains the method of development, and not the fact that there is something to develop, a further philosophic theory is made necessary. In the second place, the author holds that the attempt of Darwin himself, as of his followers, to account for the existence of a moral sense, is deficient, and does not make unnecessary the assumption of an omnipotent and authoritative 'ought.'

To the reviewer's mind, this argument is open to the following criticism. In the first place, the 'ethical import of Darwinism' that we to-day are interested in is not that here discussed, but consists in very practical and momentous questions: 'How does heredity affect responsibility?' 'What does evolution show to be the best method of treating criminals?' It is in this field of practical ethics, formerly neglected or dogmatically passed upon, that the spirit of evolutionary research has and will radically modify our views and practices. Second, the author fails to recognize that the kind of chance with which evolution deals is synonymous with 'something that needs no explanation.' If I hazard the guess that a die I am about to throw will fall on 'six,' and it really does so, I say it is 'chance,' and thereby mean that it needs no further explanation. The fact that this 'chance' may have momentous consequences does not change its character. That there is a strong temptation to be dissatisfied with this casual answer will be readily admitted, and it is this temptation to which the author has yielded in a portion of his criticism. Finally, the fact that the followers of Darwin tend to take a view of life easily distinguishable from that of those who oppose him, is itself significant of the ethical import of Darwinism. It may be true that it is *a priori* as possible to be a Darwinist and at the same time an adherent of any one of a half-dozen schools of ethics; but, as a matter of fact, ethics takes its character quite as much from the relative order and dignity of the several virtues leading to the *summum bonum* as from the view of the *summum bonum* itself.

It would be unjust to close this notice without calling attention to the plea for a science of historical ethics, and the contribution to it, by way of criticism, of current theories of 'family development,' to which the last chapter is devoted.

NOTES AND NEWS.

A VOLUME of great interest to the meteorologists of the country has recently been issued by the National Academy of Sciences, containing the first chapter of a revision, by Prof. Elias Loomis, of his numerous 'Contributions to Meteorology,' or studies based on the daily weather-maps of the Signal Service during the last thirteen years. These contributions in their original form, as presented to the National Academy and published semi-annually in the *American Journal of Science*, considered one topic after another in sequence, determined by convenience rather than by system, and therefore were greatly in need of orderly revision for use by the many students who must make frequent reference to them. Translations and abstracts of the originals have appeared in France, England, and Italy; and a serviceable review and discussion of the results gained have recently been prepared by Mr. H. H. Clayton for the *American Meteorological Journal*; but a revision by the author of the papers himself has naturally an interest and a value of its own. Professor Loomis has performed a threefold service in this work,—first, in utilizing the weather-maps to an extent not approached by any one else in the country; again, in now systematizing the results gained; and, most of all, in developing his method of simple, inductive in-