brutes: is there to be no improvement in that direction? It has been proven that modifications are taking place in his dental armature, his dermal appendages (as the hair disappearing, and so forth), and perhaps to some extent in his very form, due to dress, as encasing the feet, and strapping certain parts of the body. Will these causes not, if continued, produce their ultimate effects?

However daintily he may mask the animals he kills and devours, he is still as carnivorous as most of the *Felidæ*. He often settles his disputes by the murder of masses of his kind, and the leaders in such assaults are glorified by having monuments erected to them in the high places. In these days such monuments are seventy-five per cent more numerous than are those erected to the great among men of letters, of science, the arts, and the industries. All of this savors very strongly of savagery, and can hardly be characteristic of a fully developed race of men.

This aspect is not improved when we come to think of the vast number of what many in the world would reckon as our best developed specimens of men, whose minds are still controlled by the nursery myths, the miracles, and the fables that were told and sung to the children of the early peoples of the world in Asia. Is the mind of the man of the future to remain in such a condition of thraldom? In fact, the most of the opinions held, the institutions, the very language, the entire organization by and of the best existing types of men, are each and all to me highly indicative of a very early stage of the development of the species.

So I cannot fully coincide with Dr. Langdon when he says, "While, therefore, we may anticipate an increase in the average perfection of parts, and consequently a more harmonious development of man's present plan of structure, we cannot rationally look for any radical change in the plan itself." Although it would not demand any radical change in the *plan* of structure of present man, has it ever occurred to your correspondent that in the dim future of the world the *environment* of man may have progressively so changed as ultimately to produce a race of enormous giants; or, other conditions obtaining, a race of the veriest pygmies may be the result? Who among our present-day naturalists, had he lived in Eocene time, and become familiar with the little *Eohippus*, no bigger than a fox, would ever have predicted that from it was in time to be developed the highly modified modern horse? It is safe to say, not one, — yet *Eohippus* must have appeared quite perfect for its kind in its day.

There is every reason to believe that in the lapse of time, or when many more millions of years have rolled by, our little earth will become cold from changes now going on: she may solidify to her very core, and become as frigid as a moon, and utterly incapable of supporting any manner of life upon her surface. In fact, life will probably be at an end long before any such condition in her comes about. The last one of the human species, the very last individual of all, the very tip of the last twig of the tree of human descendants, must also die, — perish. If that modified form possesses sight, its eye may look out upon a remarkable scene indeed. Earth may be stripped of all timber; coal beds all burned up; metals all moulded into medallions, machines, and monuments; her land-surface graded nearly or quite level by causes now in operation; every other living thing, every lion, lark, and louse in the land exterminated; and nothing remaining but the works of the modified man. — R. W. SHUFELDT, M.D.

Takoma, D.C., Oct. 9.

Rain-Making.

IN *Science* for Oct. 9 Mr. Powers takes exception to a short discussion of this question prepared by myself and published in August. I have no desire to enter the discussion, but simply to correct one or two misapprehensions of my own connection with this matter. Mr. Powers gives a novel view of Plutarch's statement regarding battles and rain. The following is a translation of Plutarch: "Extraordinary rains generally fall after great battles." He is doubtful whether by these the gods would wash out the trouble from the sky "or the blood and corruption, by the moist and heavy vapors they emit, thicken the air, which is liable to be altered by the smallest cause." It hardly seems as though this corresponds with the later view of Mr. Powers. But the view of another rain-maker does not agree with that of Mr. Powers "Let 10,000 Greeks march into battle chanting their 'paeans' and shouting their 'allallas,' beating time meanwhile on their shields, while 100,000 Persians are advancing against them, continually shouting their terrible battle-cries; then let the great armies rush together with the tumult of clashing swords and shields, the hoarse death-cries and shouts of victory, and surely the sound-waves rising from such a din will literally shake the heavens, and are capable of producing no insignificant effect among the volatile currents of the upper air. Moreover, the heat generated from the struggling masses and the moisture evaporated from their perspiration would exercise a decided influence in disturbing the equilibrium of the atmospheric conditions."

Exception is taken to my very guarded statement, "During the war of the Rebellion there were over 2,200 battles, on an average *probably* as severe as the average of the 158 above mentioned" (by Mr. Powers). I have italicized a very important word. I had no time to do anything more that compare several of the running statements of the battles given in the old edition of "War and the Weather" with other facts. This I did sufficiently to satisfy myself that such a statement could be made. It is an open question in my mind just how one should treat a continued battle and firing in studying its probable effect upon the atmosphere. The more or less desultory firing in many battles could not be considered as of much importance. Moreover, any rain which fell after an interval of a few minutes must probably be regarded as in no wise due to the explosions. I do not say that the smoke and carbon from the powder might not have some influence, but whatever they had would be felt a hundred miles or more from the scene of the explosions.

Mr. Powers thinks that the currents of the atmosphere do not travel at the rate of twenty to fifty miles per hour, or, at least, during these battles they did not do so. This is a question of fact which has been proved by actual observation, and cannot be gainsaid. The only time these currents are not moving with this velocity is when a high area or "clearing condition" is passing. Mr. Powers's theory of storm formation is exceedingly unique, and possibly he could help meteorology by establishing that theory. What he would need to do would be to select a high area or a "clearing condition," and then make his explosions and note the result. It certainly is not a fact that two currents pass in opposite directions near the point of formation of our storms. Mr. Powers takes exception to my statement, "One thing seems very evident, that absolutely no rain can be obtained out of a dry atmosphere." I will now take out the word "seems" which has no business in this statement, and leave the rest without fear of contradiction by any one who reads the expression as I meant it.

H. A. HAZEN.

Washington, D.C., Oct. 12.

BOOK-REVIEWS.

Laboratory Practice. By JOSIAH PARSONS COOKE, LL.D. New York, Appleton. 16°. $1.

ALL students of chemistry are familiar with "The New Chemistry," by Professor Cooke, the first edition of which appeared eighteen years ago, when it was one of the earlier volumes of the International Scientific Series. That book, which has fascinated so many, now appears in a revised and enlarged form. The book now issued is described by the author as a "companion volume to 'The New Chemistry.'" As will be remembered, the earlier book was largely descriptive of the problems and theoretical discussions of modern chemistry. "Laboratory Practice" gives a series of experiments on the fundamental principles of chemistry. The purpose of the author is to furnish the beginner in chemistry with a text-book which shall aid him in doing his laboratory work, but only when this work is carried out under the guidance of a competent teacher, — a teacher who can speak to the students from the fulness of his own knowledge. Professor Cooke, as the head of the chemical department of Harvard College almost as long as there has been such a department — for more than forty years — has had great experience as a teacher of chemistry, and it is certain that each and all of those who have had the pleasure of tak-

ing courses under him can testify that he could always speak from the fulness of his knowledge. It has seemed in perusing this new book that the author did not always appreciate that others had not equal experience, and to those who find descriptions of apparatus difficult to follow without the aid of illustrations, their almost total absence may be disappointing. But it is enough to say that Professor Cooke has brought out this new book to make sure that all teachers of chemistry will be anxious to examine it.

Eighty-odd experiments are described, some of them, owing to the modern developments, of a physical rather than of a chemical nature as formerly understood. The apparatus called for is not expensive, and can be rendered even less so by resort to various make-shifts, which are, however, always bothersome and time-consuming.

Conduct as a Fine Art. The Laws of Daily Conduct, by NICHOLAS P. TILMAN; *Character Building*, by EDWARD P. JACKSON. New York, Houghton, Mifflin & Co. 12°. $1.50.

SOME time since the American Secular Union of Philadelphia offered a prize of one thousand dollars for the best treatise for teaching morals in the public schools without inculcating any religious doctrine, and the prize was divided between the authors of the two works here named. They are quite different in literary form, Mr. Gilman's being an essay in several chapters, and Mr. Jackson's a series of conversations between a teacher and his pupils. Religion as a basis of morality having been set aside, it is held to be necessary to give it a "scientific basis;" and Mr. Gilman in particular makes special claims for his work on this account. After a careful reading of it, however, we are unable to find any scientific quality in it. The only way to make ethics scientific is to find the ultimate ground or criterion of right and wrong, and then deduce all minor principles from this fundamental one. But Mr. Gilman expressly repudiates any design of doing so, apparently because he has no settled opinion as to what the criterion is. Nor is there anything scientific in the arrangement of his work; on the contrary, it is a series of desultory chapters which might just as well have been arranged in any other way. Mr. Jackson makes much less pretension of being scientific; but after reading both works we can readily understand the statement in the preface that the society that offered the prize was not satisfied with either of them.

But in saying these things we do not wish to be understood as condemning the essays, either of them. They present the common-sense ethics of the time in a form suitable for instructing children, and in the hands of good teachers may be made useful. They are intended rather for teachers than for pupils, it being supposed that the teacher will instruct his pupils orally; and teachers of strong moral instincts who are also good talkers would probably teach best in that way. To such teachers this book will undoubtedly furnish many valuable hints.

A Hand-book of Industrial Organic Chemistry. By SAMUEL P. SADTLER, Ph.D. Philadelphia, Lippincott. 8°. $5.

WAGNER'S "Chemical Technology," which is about the only book of moderate size in English which describes the chemistry of industrial processes, is now somewhat antiquated, though doubtless some day a new edition will appear. There are the encyclopedias of chemistry and of chemical industries, but no single volume.

Dr. Sadtler has endeavored, within the compass of a moderate-sized octavo, to take up a number of the more important chemical industries, or groups of related industries, and to show in language capable of being understood, even by those not specially trained in chemistry, the existing conditions of those industries. The present volume is limited to industrial organic chemistry. This field, while covering many very important lines of manufacture, does not seem at present to be so well provided for as the inorganic part of the subject. A companion volume, covering this other side of industrial chemistry, is in contemplation.

In taking up the several industries for survey, there are first enumerated and described the raw materials which serve as the basis of the industrial treatment; second, the processes of manufacture are given in outline and explained; third, the products, both intermediate and final, as well as side-products, are characterized and their composition illustrated in many cases by tables of analyses; fourth, the most important analytical tests and methods are given which seem to be of value either in the control of the processes of manufacture or in determining the purity of the product and, fifth, the bibliography and statistics of each industry are given, so that an idea of the present development and relative importance of the industry may be had.

The author has endeavored in a number of cases to give a clearer picture of the lines of treatment for an industry by the introduction of schematic views of the several processes through which the raw material is carried until it is brought out as a finished product.

The subjects treated are: petroleum and mineral oil industry; industry of the fats and fatty oils; industry of the essential oils and resins; the cane-sugar industry; the industries of starch and its alteration products; fermentation industries; milk industries; vegetable textile fibres; textile fibres of animal origin; animal tissues and their products; industries based upon destructive distillation; the artificial coloring matters; natural dye-colors; bleaching, dyeing, and textile printing.

That such a book is needed cannot be questioned. It will be of value to the specialists engaged in industrial chemistry and to the general reader seeking information.

The author has had experience in writing chemical books and in editorial work. The number of illustrations is large, and they are well made and increase materially the value of the book for the purposes for which it is intended. There is also a considerable number of valuable tables.

A Study of Greek Philosophy. By ELLEN M. MITCHELL. Chicago, S. C. Griggs & Co. 12°. $1.25.

THE authoress of this book has been for some years the leader of a band of ladies who have devoted themselves to the study of philosophy. Being a disciple of Hegel, it was natural that she should devote special attention to the history of philosophy, that aspect of the subject having been given special prominence by Hegel himself and by some of his principal followers; and this sketch of the Greek philosophy is the outcome of her studies. It is written in an earnest and serious spirit, and with an evident desire to present the truth as the writer understands it. It is impartial, too, as between the different schools and thinkers, none of them being slighted and no decided preference shown for one over another except as their real importance demands it. The chief fault of the book, to our thinking, is its excessive Hegelianism. In treating the various Greek thinkers, those points in their teaching that seem to anticipate Hegel's philosophy, or lend it support, are given special prominence, and sometimes there is a tendency to read into the ancient writers views derived from Hegel himself. Then the frequent repetition of the Hegelian catchwords, such as "self-consciousness," "the idea," "subjectivity and objectivity," the "infinity of mind," etc., detracts from the merit of the work.

Miss Mitchell has followed Zeller largely in her interpretation of the Greek thinkers, but has also derived something from Hegel's history of philosophy, and she quotes occasionally from both these writers. Her account of the earlier philosophers is one of the best parts of her work, their leading characteristics, as far as known, being very clearly presented in a small space. In the chapters relating to Plato and Aristotle the dialectics and physics of these writers are examined at greater length than seems necessary; while in the latter part of the book we could have wished for a little more information about the relations between Greek philosophy and Jewish and Christian thought. But though the book is not free from faults, it has much to recommend it, and it will be specially acceptable to adherents of German philosophy.

The Philosophy of the Beautiful. I. Its History. By WILLIAM KNIGHT. New York, Scribner. 16°. $1.

THIS book is one of a series to be published by John Murray in England and by Messrs. Scribner in America, and designed to furnish books for study and reference on a variety of subjects. They bear the general title of "University Extension Manuals,"