

a particle of mist to settle to the bottom. Under the compressions employed by Espy, the cloud or mist entirely disappears in a few seconds, and not an atom of moisture reaches the bottom of the jar. Suppose, now, that, at the instant of expansion, latent heat were liberated by the formation of the cloud, which would prevent a further cooling. It is very plain that it would be used up immediately in the evaporation of the cloud; and the disappearance of the mist proves that the sensible heat has again become latent, and can have absolutely no effect in expanding the air or in causing a final higher gauge reading, as Espy thought.

A note should be made of the condition of Espy's moist air. The presence of a haze or cloud is no evidence of saturated air, for such cloud has been produced in air having only two per cent of moisture. When air is pumped in from the room, it has an enormous number of dust-particles in it, and these give the semblance of fog on sudden expansion. Espy tried to saturate his air by putting a little water into his jar, but it is certain that this expedient would be of little or no effect. Bubbling air through three inches of water will not saturate it, and it was found that nearly all expedients failed to do so. The only satisfactory saturation could be effected by passing the air through a bottle full of small pieces of sponge saturated with water. While we cannot think that Espy's air was saturated, yet it is certain that the experiments in 1889 were with saturated air, and hence must have shown a difference between dry and moist air, if any could have done so. The delay of several days in some of Espy's experiments after compression before explosion should have served, and probably did serve, to increase the moisture in the air, and not to diminish it, as he thought, and as his researches seemed to indicate. It might be thought essential, in order that this question may be settled beyond all doubt, that there be some explanation of Espy's results showing a slightly greater rise in the gauge after expanding dry air than when moist or partly moist air was used. Undoubtedly, if all the conditions were known, the difference could be easily explained. It is absolutely certain that it was not due to any latent caloric or elasticity that was given out by the moist air.

I think this discussion will enable us to reason more or less effectively as to what are the probable heating and cooling effects in the free atmosphere from descending or ascending currents, and the resultant liberation or production of energy. It is well known that the most perfect locomotive makes use of only five to ten per cent of the total energy developed. We have just seen, that in condensing air to 10 inches, instead of obtaining an increase of temperature of  $163^{\circ}$ , as theory seems to indicate, we have barely reached  $4^{\circ}$ , or one-fortieth of the theoretical amount. It is plain that this is due to the loss of heat into the environment of the air. Suppose, now, we take away this confining jar; suppose we make steam in the open air instead of our locomotive boiler; or suppose, instead of trying to compress air in our jar, we had the total horse and steam power of the whole earth engaged in compressing the free air by forcing it through syringes or force-pumps into the atmosphere. What would be the result? The utter absurdity of all this is most plainly manifest, but is it any more so than the attempt at developing effective energy in the free air, as has been theoretically accomplished by some? If there is this

enormous dissipation of heat under conditions which we can control, must there not be a very much greater dissipation of heat in all out-doors? Is it not highly probable that many of the theoretical deductions find their only shadow of support in the fact that the assumptions call for a perfect engine without loss of a particle of energy? Has theoretical meteorology ever produced even a single essential effective element or part of this perfect engine? If the considerations herein set forth are borne out by subsequent researches, we must most certainly come to the conclusion that thus far theoretical meteorology has not had a single well-supported fact on which to base its profoundest theories of tornado generation and movement. Professor Wild of St. Petersburg has well said, "Without exact and satisfactory data, meteorology cannot develop as a science, but will be, as heretofore, mainly a tumbling-ground for vague speculations and dilettanti investigations." H. A. HAZEN.

#### LETTERS TO THE EDITOR.

*\* \* Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

*The editor will be glad to publish any queries consonant with the character of the journal.*

*On request, twenty copies of the number containing his communication will be furnished free to any correspondent.*

#### Ohio Meteorites.

UNDER date of June 13, Mr. George F. Kunz, in an article in *Science* upon meteorites, mentions two copper ear-rings found by myself in an Ohio mound as partly composed of meteoric iron. Mr. Kunz is in error as to the locality of the find. It was made at Frankfort, Ross County, O., and not in the neighborhood of Fort Ancient, as stated in the article.

The ear-rings are coated with a heavy plate of the iron, and are splendidly preserved, the iron having resisted atmospheric agencies remarkably well. It is slightly corroded in one place only.

The state of preservation is due to the placing of the objects in a layer of fine, dry gravel by the builders of the mound. The nearest skeleton was distant five feet, and the ear-rings did not accompany any remains. However, there were three copper hatchets placed alongside these ear-rings, and five other spoons or ear-rings, too; but these latter were not covered with meteoric iron, or any other substance. The mound was examined in April, 1889.

WARREN K. MOOREHEAD.

Xenia, O., June 18.

#### Vertical Components of Motion in Cyclones and Anticyclones.

IN saying that there is an ascending component of motion in cyclonic areas, and a descending component in anticyclones (*Science*, May 30), I meant that the winds in these areas of low and high pressure do not move horizontally, but obliquely upwards or downwards. The evidence of this has been presented and discussed by Loomis, in his "Contributions to Meteorology," in the *American Journal of Science*; and an abstract of these has been prepared by Clayton for the *American Meteorological Journal*. Hann and others have also discussed the matter. If Mr. Velschow, who makes inquiry on this point in *Science*, June 20, is not already acquainted with the writings of these authors, a reference to them would perhaps satisfy him. W. M. DAVIS.

Cambridge, Mass., June 21.

#### BOOK-REVIEWS.

*Locke.* By ALEXANDER CAMPBELL FRASER. Philadelphia, Lipincott. 16°. \$1.25.

THIS the latest volume of Blackwood's "Philosophical Classics" is one of the best of the series. It opens with a quite full account of Locke's early life and education, with brief sketches of his family and the various persons with whom he came in contact in those years, and by whom he may be supposed to have been influenced. It then recounts his entrance into political life, and the

various vicissitudes he experienced in consequence of the frequent changes of government, culminating in a ten-years' exile in Holland. These ten years were quite probably the most important in his whole life; for it was chiefly during this time that he thought out and composed his "Essay on the Human Understanding," and also some of his most important political treatises. The later events of his life, together with the history of his various works, are related by Professor Fraser with care, and with as much fullness as most readers will desire.

The account of Locke's life, however, is kept subordinate to the analysis and criticism of his philosophy,—a task which Professor Fraser has performed with great clearness and philosophical acumen. He remarks in his preface how great has been the influence of Locke's "Essay" upon subsequent thought, and that it "seems in excess of the author's speculative depth and subtlety or grandeur of character,—a remark with which most readers of the work at the present day are likely to agree. Professor Fraser shows, however, in another place, to what this influence is really due. Locke was the first thinker to place at the very portal of philosophy the question as to the "origin, certainty, and extent of human knowledge;" and, though he failed to answer the question himself, it has been recognized ever since as the main problem in human thought. When Professor Fraser comes to inquire why it was that Locke failed to solve the problem, he shows plainly that it was due to an insufficient comprehension of the intuitions of reason and of their philosophical importance. Locke did not deny their existence,—on the contrary, he expressly recognized their truth and self evidence,—but he assigned them a subordinate place in his scheme, and therefore failed to give a satisfactory account of our ideas of substance, infinity, causation, and others, which cannot be derived from external or internal sense. Professor Fraser's discussion of this point is very able; and all who wish to understand Locke's work, and his place in the history of philosophy, will do well to read this book.

*Russia: its People and its Literature.* By EMILIA PARDO BAZÁN. Tr. by Fanny Hale Gardiner. Chicago, McClurg & Co. 16°. \$1.25.

THE object of this work is to give an account of the present state of society and opinion in Russia, with a more particular examination of the works of the Russian novelists. Señora Bazán tells us at the outset that she is not acquainted with the Russian language; but she has read largely of the works in other languages that treat of Russia, together with all the translations from Russian literature that have appeared. She has also associated considerably with Russian authors and revolutionists in Paris, and by all these means has obtained materials for an interesting book. Of course, in a small book prepared in this way, we cannot expect any thing specially new or original; but the reader will find in it a clear and instructive delineation of the more important phases of Russian life and literature as the authoress understands them. She begins by briefly noting the leading points in Russian history, and then gives us a study of nihilism, which to our mind is the most interesting part of the book; while the rest of her remarks relate mainly to the new school of Russian novelists, beginning with Gogol, and ending with Tolstoi. Nihilism, she thinks, as others have thought, is in great part the product of the atheistical and pessimistic philosophy of Germany, though political discontent has had a share in forming it; and she shows clearly that it is confined to the more active and educated classes, the peasantry and workingmen generally showing thus far no sympathy with it. The characteristics of Russian fiction are attributed partly to nihilism, and partly to the spirit of "realism" which pervades all the fiction of the age. After spending several years, however, in the study of her subject, Señora Bazán confesses herself somewhat baffled, and ends with the remark, "Russia is an enigma; let those solve it who can—I could not."

*Pestalozzi, his Life and Work.* By ROGER DE GUIMPS. Tr. by J. Russell. (International Education Series.) New York, Appleton. 12°. \$1.50.

ABOUT a year ago we had occasion to notice a translation of De Guimps's "Life of Pestalozzi," by Miss Crombie, and we are now

favoring with another by a different hand. Of the two, the rendering by Mr. Russell seems to us the best. We have not the French original at hand to test the accuracy of the work, but this is vouched for by Rev. R. H. Quick, who writes a brief introduction; and the translation reads like an original composition in English, thus making an interesting book. Moreover, it is complete, the narrative being given entire, with very copious extracts from Pestalozzi's own writings. It is therefore the best account of his life and work to be found in English, and is well worthy of a place in the series to which it belongs.

Of Pestalozzi himself we have perhaps said enough in former articles; but we may cite a few remarks by Mr. W. T. Harris in the "Editor's Preface," which he contributes to the volume. He holds, and rightly, that the Swiss educator's importance consists not so much in his method of teaching as in his ardent desire for the education and elevation of the poorer classes, who, previous to his time, had had virtually no education at all. According to Mr. Harris, "he is the first teacher to announce convincingly the doctrine that all people should be educated,"—a doctrine now held and more or less effectively practised in all civilized countries. It was to this end that all his labors were directed, and he had thus the honor of leading the movement for universal education. Of his method of teaching, Mr. Harris does not speak so highly, believing in particular that he laid too much stress on the mere training of the senses, and too little on the development of the thinking faculty. With these views we agree; and we cannot help adding, that, in our opinion, an efficient practical method was just what Pestalozzi lacked, the failure of all his educational experiments pointing strongly to this conclusion.

#### AMONG THE PUBLISHERS.

IN the *Atlantic* for July, Professor Shaler writes about "Science and the African Problem." Mr. Albert Bushnell Hart's paper on "The Status of Athletics in American Colleges" may be called "timely."

—Messrs. Ginn & Co. announce a revised edition of "Our Government," by Jesse Macy, professor of constitutional history and political economy in Iowa College.

—Edward Heron-Allen, the well-known expert in palmistry, has an article upon "The Cheiromancy of To-Day" in *Lippincott's Monthly Magazine* for July.

—The July number of the *Contemporary Review*, issued in this country in the original English form by the Leonard Scott Publication Company, New York, will contain a paper by Edward Bellamy.

—Any of our readers who are planning a trip to Europe should look at the "Guide to Europe" published by Houghton, Mifflin, & Co., and edited by the well-known Stoddard. The book is of convenient size, is well made for its special purpose, and contains just the information required by the vacation tourist. A new edition appears each year.

—The contents of the first number of the fourth volume of the *Journal of Morphology* (Boston, Ginn & Co.) are as follows: "The Origin of the Cerebral Cortex and the Homologies of the Optic Lobe Layers in the Lower Vertebrates," by Isaac Nakagawa, B.Sc., Princeton College; "The Skeletal Anatomy of Amphiuma during its Earlier Stages," by O. P. Hay; "The Segmentation of the Primitive Vertebrate Brain," by Charles F. W. McClure, fellow in biology at Princeton; "The Life History of the Formed Elements of the Blood, especially the Red Blood Corpuscles," and "Observations upon the Occurrence, Structure, and Function of the Giant Cells of the Marrow," by W. H. Howell, Ph.D., lecturer in physiology and histology, University of Michigan.

—Some weeks ago we noticed the proposed series of popular science books to be published in this country by Macmillan. The first of this series, which appears under the general title "Science in Plain Language," is by William Durham, a fellow of the Royal Society of Edinburgh, and consists of a number of short essays on evolution, antiquity of man, bacteria, the basis of life, ancient lake-dwellings, etc. The titles would lead one to suppose the book to be of a somewhat disjointed character, but the author's aim was to