lying on the west side of the range, lies a little basin named Avalanche Basin by Mr. L. B. Sperry, of Oberlin, Ohio, and on the mountains overlooking this, Mr. Sperry tells us, are extensive snow fields and a glacier. From the summit of Blackfoot Mountain it appears that this Avalanche Basin lies nearly south of Mt. Piegan of my map, and southwest of Mt. Reynolds. I understand that Mr. Sperry, who was, of course, unaware that the mountain had been earlier named, has called Mt. Reynolds Matterhorn from the slender—as seen from the southwest—finger of rock which forms its peak. .Mt. Reynolds is in the Continental Divide, although most of the recent maps wrongly place it east of the Divide.

If the locations of the Pumpelly glacier and of Avalanche Basin with regard to definite and well-known points in the Continental Divide are thus established, the matter is one of some interest to students of this section of the northern Rocky Mountains, since hitherto, so far as I am aware, the relations of the east and west sides of the range have not been known between the head of Belly River and the Cut Bank Pass.

Lying nearly to the south of Mt. Jackson, and between it and the Blackfoot Mountain, is a deep basin which is the head of Harrison Creek, flowing down toward the Flathead Lake. This basin, which I have called Pinchot's Basin, is occupied by a large glacier, which is fed by many smaller ones flowing down the steep side of Mts. Jackson, Kainah and Blackfoot. What the extent of this glacier may be I do not know, but lying in this deep basin, and almost completely surrounded by high mountains, the area of the moving ice must be very considerable.

Geo. Bird Grinnell.

SCIENTIFIC LITERATURE.

Outlines of the Earth's History. By N. S. Shaler. D. Appleton & Co. 1898. Price, $1.75.

This 'Popular Study in Physiography' is the latest of a number of attractive publications dealing with geological and geographical themes, from the pen of the professor of geology at Harvard. As in the case of the 'Aspects of the Earth,' published in 1889, the present volume of over four hundred pages is a series of essays on some of the broader phases of the earth's history.

Popular scientific books, well written, clearly printed and attractively illustrated, are year by year becoming more and more numerous, and are taking the place of novels, especially among the more intellectual and cultivated readers. It is to this as yet small library of nature-novels that the 'Outlines of the Earth's History' belongs.

The nine essays comprising the volume and forming as many chapters are:

I. An introduction to the study of nature.
II. Ways and means of studying nature.
III. The stellar realm.
IV. The earth.
V. The atmosphere.
VI. Glaciers.
VII. The work of underground water.
VIII. The soil.
IX. The rocks and their order.

As may be seen from this outline, the volume, although embracing a wide view of nature, is not a systematic treatise, and does not fill the place of a text-book on physiography. It is a collection of graphic essays, each of which may be read separately without detracting from its value, designed to lead the reader by easy paths to a sufficiently elevated, intellectual standpoint, to command a comprehensive view of what the author terms the natural realm.

Following the first two chapters, which are of the nature of an introduction, dealing briefly with the ways in which barbarous and civilized men view their surroundings, and suggesting methods to be pursued in nature study, comes a description of the stellar realm. Most of the material in this third chapter is of necessity borrowed from astronomy, and presents, among other discussions, a clear statement of the nebular hypothesis, as formulated by Kant and Laplace. But scant, if any, attention is given, however, to the modification of this explanation of the earth's origin, presented especially by Lockyer and known as the meteoric hypothesis. A reason for this omission is perhaps to be had later in the book, where it is stated that meteors may possibly have been ejected by volcanoes of our own and other planets, a view

that is not shared by many students of nature. As meteors are still coming to the earth, and everyone has seen 'shooting stars,' the meteoric hypothesis, by appealing to a process still in action, by which the earth may have been formed, is particularly attractive as a subject for popular presentation.

The chapter on the atmosphere contains not only an instructive summary of some of the leading facts concerning the outer envelope of the earth, but, overstepping all stereotyped methods, deals also with the changes which the movements of the air, and the circulation of water vapor in it, make upon the seas and lands beneath. The freedom in this connection that a popular essay seems to demand, is indicated by the variety of themes embraced in this discussion of the atmosphere. These are 'whirling storms;' 'the system of the waters,' including the waters stored in the earth or rock-waters, the nature and origin of tides, the action of shore waves, the character of sea beaches and cliffs, etc. 'ocean currents,' their influence on climate and on the distribution of life, and connection with past geological changes; 'the circuit of the rain;' 'the geological work of water;' under which falls the sculpturing of the land by streams; and 'lakes.' Such a highly complex group of subjects in a chapter of one hundred pages, while not to be tolerated in a systematic treatise on physiography, does not seem out of place in a story book of nature. Systematic works are apt perhaps to impress one with the view that the operation of natural forces are independent and stand alone, each complete in itself, but a more general view, in which their mutual dependence and interaction are made prominent, is no doubt best for popular presentation. However comprehensive a book may be, one essential is that facts and principles should be accurately stated. Here enters one of the leading difficulties in popular writing. For example, on page 101, in describing the ascent of warm air in circular storms, the draft in a chimney is introduced as an illustration, and the statement made that 'the heated lower air breaks its way up the shaft, gradually pushing the coolor matter out at the top,' and, later, 'wherever the air next the surface is so far heated that it may overcome the inertia of the cooler air above, it forces its way up through it in the manner indicated in the chimney flue.' Now, does the warm air rise and force its way through the cooler and denser air above, by reason of any force inherent in itself; is it not that the attraction of the earth is less, volume for volume, for warm than for cold air; the former being forced to rise by the denser air following under it and forcing it upward.

In this same connection attention may be directed to certain statements which, as the saying is, would 'puzzle a mathematician.' In discussing the flattening of the earth at the poles, page 82, we read, 'the average *section* at the equator being about twenty-six miles greater than that from pole to pole.' Again, in writing of the rebound of a marble when dropped on the floor, page 366, it is stated that the marble becomes 'shorter in the axis at *right angles to the point* which was struck;' also, on page 369, occurs the statement that the 'movements of this wave are at *right angles to the seat* of the originating disturbance.' The italics are by the present writer, and meant to emphasize the opinion that these statements are unintelligible.

One aim in popularizing science is to root out superstitions and in their place, if possible, substitute rational explanations. In this connection Shaler strikes a blow at the time-honored 'Jack-o'-lantern' or 'Will-o'-the-Wisp' which many of us have been looking for in vain since childhood. This ancient spook needs to have better credentials, or else forever disappear from our swamps; or, more accurately, its uncertain light should be dispelled from men's fancies.

The breadth of view and comprehensive character of the remaining essay n glaciers, the work of underground water, the soil, etc., is perhaps sufficiently indicated by the statements just made in reference to the complex groups of phenomena discussed in the chapter devoted to the atmosphere.

Throughout the book there is an aim to cultivate what has been termed the scientific use of the imagination, or the power of forming mental visions of the relations of matter, space, time, etc., which are beyond the power of the eye to grasp, and transcend daily experience.

The earth, for example, as it would appear to an observer on the moon, with the daily passage of its continents from light to shadow, and annually recurring seasonal changes, requires an exercise of the imagination of a high order. In a similar way, various hypotheses to account for the origin of the earth, the larger movements of the atmosphere and of the ocean, the flow of glaciers, the origin of volcanoes, etc., call not only for a knowledge of facts and principles, but the power to group them in the imagination and follow step by step the many changes that are involved. The student of nature has to create in his own mind pictures of the workings of nature ranging in scale from the movements of molecules to the revolution of planets and siderial systems. It is in this field that the book before us excels. One cannot read its glowing pages without having his imagination greatly stimulated. The rigid boundaries that circumscribe systematic treaties are very properly ignored, and freedom given the imagination to build castles, or rather cathedrals, in the air, to illustrate Nature's architecture.

One phase of the use of imagination in scientific research is the trial by hypotheses. As many plausible explanations as possible of a given phenomena are invented, and the erroneous ones eliminated by careful tests. In this process of multiplying of hypotheses but few men excel the author of the book under review. The search for a true explanation necessitates the destruction of many trial explanations. Every scientific investigator, it has been said, lives in the midst of a cemetery of defunct hypotheses. Strange as it may seem to the uninitiated, every true investigator tries to kill his own hypotheses, in order that only the strong may live. His zeal in this direction being excelled only by the desire to kill the hypotheses proposed by others. In the intangible world of ideas, as in the organic realm, the fittest survive. To most readers of popular science this struggle is practically unknown, and the hypotheses presented to them are accepted as well established laws. For this, if for no other reason, only such hypotheses as have been exposed in the searchlight of criticism, and have been generally accepted by specialists in the particular field of science to which they pertain, deserve a place in popular-science books. It is in this connection that the volume before us seems most widely open to criticism.

An explanation of the movements of the tides and the flow of glaciers placed side by side before the general reader or the student just entering on the study of nature, are accepted as equally worthy of credence, and are apt to take such firm root in the mind that a shock is felt when one of them has to be modified or rejected.

The explanation of the flow of glaciers, and especially the view that continental glaciers, in their central and deeper portions, float on a cushion of water or of half-melted ice, for the reason, if no counteracting agency exerted an influence, that the ice at the bottom of such a glacier would melt because of the presence of its own mass, the melting point of ice being lowered by pressure, is one of the many attractive hypotheses that have sprung from Professor Shaler's fruitful brain, but one not generally accepted by glacialists. This tendency to give precedence to one's own hypotheses is again manifest in discussing the nature and origin of volcanoes. The changes which water-charged sediments would undergo if depressed to a depth of many thousands of feet (Shaler suggests twenty miles!) is elaborated as the main explanation of the origin of volcanoes. While this hypothesis fascinates the mind, and explains many of the facts observed during volcanic eruptions, notably the vast volumes of steam given forth, it has not withstood the tests of criticism in such a way as to warrant its presentation to the public as the sole and final explanation of volcanic phenomena.

While it is not the province of a reviewer to dwell on typographical errors, I will note one slip for which having been called to account myself, I can warn others against. In the English translation of Palmieri's book on the Eruption of Vesuvius in 1872, a certain gulch on the side of the mountain is called the 'Atria del Cavallo,' the word *atria*, according to the dictionaries, should be *atrio*. This mistake has been repeated on page 285 of the book under review.

While several of the plates reproduced by Shaler are excellent, notably the one of a pebble-beach and the pictures of breakers on the shore of Martha's Vineyard, some of the cuts in the text are decidedly poor. The small woodcut intended, according to title, to represent a sun spot, and another of a portion of the moon's surface, should certainly be replaced by something better in future editions.

In the preface of the volume the statement is made that it is intended for beginners in the study of the earth's history. It seems to the present writer that this claim is too modest, as the book can be used with both pleasure and profit by the advanced student and even by the most experienced veteran in physiography, as well as by the novice. In fact, the many suggestions and original observations, strewn thickly along the general pathways that are followed, are among the greatest charms of the book. Some of these branches of the general current of thought may perhaps lead the beginner astray, but to more experienced explorers they serve to show how vast is the space surrounding the known.

In every library there should be a new shelf for romances of nature, and one of the first books to be placed thereon, whether in the home, school, university or circulating library, should be the 'Outlines of the Earth's History.'

ISRAEL C. RUSSELL.

Die Chemie in täglichen Leben. Gemeinverständliche Vorträge. By PROFESSOR DR. LASSAR-COHN. Hamburg und Leipzig, Leopold Voss. 1898. Third Edition. 8vo. Pp. vii+317.

A German book on chemistry which has experienced three editions in as many years, and translations of which into several foreign tongues have been made or are in preparation, as the author's prefaces inform us, must have struck a responsive chord in public favor.

These lectures on chemistry in daily life are twelve in number. They cover a wide range of topics; foods, illuminants, explosives, leather, coal-tar colors, ceramics, Röntgen rays and many other subjects are discussed.

At times the grouping of themes presented in one lecture seems rather incongruous. Thus, in one instance, lecture twelve, metallic alloys, alkaloids, anæsthetics, anti-pyretics and disinfectants all come in for consideration.

This appears to be rather a varied menu for an intellectual repast, especially if one intends following the author's admonition and dispose of it at one sitting. For the preface says: "As the individual lectures had the customary duration of one hour a corresponding amount of time ought to be devoted to their perusal."

The style is terse and clear; typography and paper good.

FERDINAND G. WIECHMANN.

Introduction to the Study of Organic Chemistry. By JOHN WADE, B.Sc., Senior Demonstrator of Chemistry and Physics at Guy's Hospital. London, Swan, Sonnenschein & Co. 1898.

The author has adopted a method of treating the subject which is exactly the reverse of that commonly employed. He starts not with the simple hydrocarbons, but with some of their derivatives, and does not give the properties, etc., of the hydrocarbon until he has taken up the complex derivatives. As he states in the preface, 'the book proceeds from the familiar to the unfamiliar.' The application of this method can, perhaps, be best shown by an extract from this preface: "The first substances to be studied are the typical alcohol and acid akin to the inorganic bases and acids, and the study of these leads to the theory of radicals. The other simple alcohols and acids are next dealt with, and the ideas of homology and isomerism introduced. The construction of the net-work of cross connections typical of organic chemistry is now commenced, with the aid of the ammonia derivatives and cyanogen compounds, and the necessity of the theory of structure shown. The structural formulæ of the various compounds having been duly established, the simple aldehydes are introduced, and with them the conception of polymerism; then the simple ketones and secondary alcohols, with the theory of position isomerism; and the iso-alcohols and acids, with the theory of branching-chain isomerism. Finally, the simple hydrocarbons are dealt with, and the preceding work codified in the theory of substitution."

It is difficult to see how one can gain a clear idea of the more complex substances without