

liar with ordinary rock specimens. It would be better that Geology of this sort should be associated with a subject like mining, instead of being placed in the position it at present occupies.

Mineralogy, in any right sense, is only applied chemistry, and would be more in place as a recognised portion of the chemical curriculum in such an Institution than as a part of geology. Few geologists pretend to mineralogy beyond a sufficient knowledge of the general external characters of rocks for the recognition of the commoner varieties. Palæontology, on the other hand, as a subject of systematic study, is but a phase of biology, and cannot without violence be linked with subjects arising out of the laws which govern the inorganic world.

In thus enlarging upon our former remarks, we are actuated solely by a desire for the success of an undertaking which has our entire sympathy.

Just as we are going to press we learn that it has been determined to push forward the arrangements so as to enable the College to open its doors in October. This is a wise decision on many grounds. The first week in October has become the recognised time for the commencement of winter courses of lectures, and delay beyond that might easily entail the loss of a whole year. Of the 30,000*l.* required, upwards of 17,000*l.* has already been subscribed, without any systematic canvass, and we can scarcely doubt that the remainder will be forthcoming. On public grounds we would venture earnestly to second the appeal made by the Committee, and to express the hope that the liberality of the coal-owners, manufacturers, and merchants of the district will enable them to open the Institution free from pecuniary embarrassment, and clear of the manifold difficulties that beset an undertaking burdened at the outset with debt. We also hear at the same moment that the Committee has again debated the question of a biological professorship. That body seems to be undecided as to whether it would be less ridiculous to ignore biology entirely, or to include it with a number of quite distinct branches of science in a sort of miscellaneous professorship, and the prevailing view *now* seems to be that, on the whole, the former alternative is the least conspicuously absurd. Surely there is a third course open to the Committee. We trust wiser counsels will prevail, and that we may never have to record that in Newcastle—the home of Bewick and Selby, Fryer and Alder, Winch and Robertson, not to name a host of living biologists—in the focus of the Tyneside Naturalists' Field Club—a College of Natural Science has been established in which Natural History in its higher aspects is excluded as a subject of study.

STAVELEY'S BRITISH INSECTS

British Insects. A familiar Description of the Form, Structure, Habits, and Transformations of Insects. By E. F. Staveley, Author of "British Spiders." (London: L. Reeve and Co., 1871.)

TO compose a work on so extensive and difficult a subject as "British Insects," which shall convey a large amount of useful and interesting information without being too much overloaded with bare facts,—which shall be accurate without being dry, and amusing without being flippant,—is no easy task, yet it is accomplished by the

author of this work in a very creditable manner. The introductory chapters are condensed and clear, just giving enough information on the general structure and economy of insects to interest the uninitiated reader, and lead him on to the more detailed account of each order given in the succeeding chapters.

An excellent feature of the work is the clearness of the type, and the well-executed woodcuts which somewhat too sparingly illustrate the text, while sixteen coloured plates by Mr. Robinson contain admirably life-like portraits of nearly a hundred of our most conspicuous or most interesting insects. A few extracts will best illustrate the author's style. In the chapter on the larvæ of Lepidoptera it is remarked, that there is neither time nor place in which we may not find the traces of these creatures or the creatures themselves.

"If at one time of the year we tear a handful of moss from the trunk of a tree, out drop some little brown chrysalids; if at another we drag a tuft of grass up by the roots, there we find silken tubes, the homes of some small caterpillars. We find them in fungi, we find them in grain, we find them in teazel-heads, in fir-cones, in rose-buds, and in fruit; and the Hymenopterist, carefully watching the insect emerging from a gall, discovers that he has reared in it a moth! On the face of a lichen-covered rock we see a moving fragment, and lo! a little caterpillar, neatly encased like a caddis-worm in a tent of lichen, is moving and feeding, safe even from the bird's sharp eye. We open our drawers, and there, oh, sight of horror! What is that streak of white silk upon the best garment—the garment laid by, too good for common wear? We look farther; what is that dusty little roll? It is a great-coat on a microscopic scale. It matches our best garment ominously. It moves—a head peeps out—some little legs, and away it walks!—tell not the housekeeper!—away it walks in safety from the admiring Entomologist."

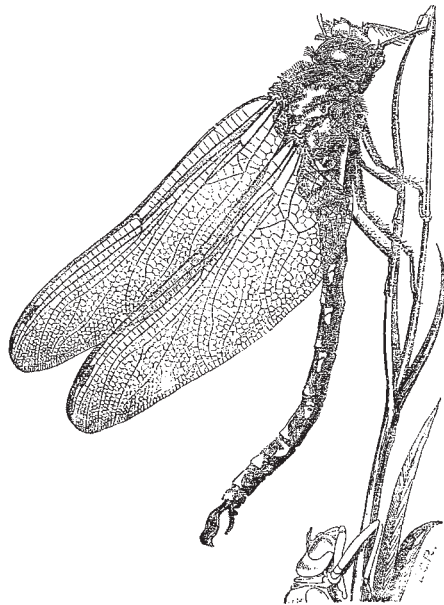
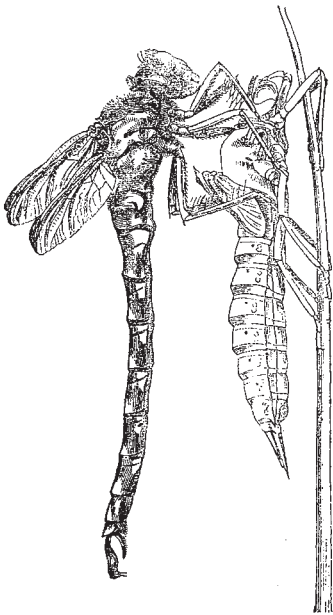
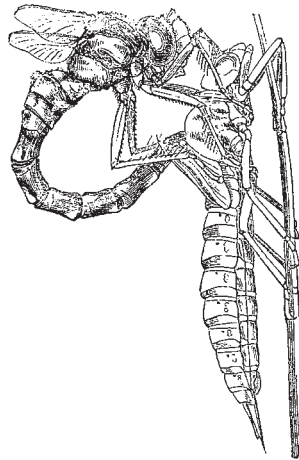
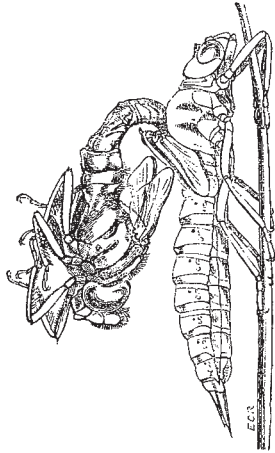
As an example of the woodcut illustrations we give the series showing the progressive stages in the transformations of the dragon-fly. The sluggish mud-coloured pupa ascends the stem of a grass or any other stalk of convenient size which rises above the surface of the water, after a time the skin cracks behind, between the wing cases, and the head and thorax of the enclosed fly are drawn out. The abdomen follows, the insect turning up and clinging to the pupa case, where it remains till the wings increase to the full size so rapidly that they can be seen to grow.

In the chapter on Diptera there are some good remarks on the many erroneous uses of the term "Fly."

"Being a 'popular name' the people have a right to mean what they choose by it, and they avail themselves of the right—some meaning by it one thing, some another, some every flying insect for which they know no other name. Thus the 'fly' of the former is usually the little hopping turnip beetle; the 'fly' of the hop-grower is an aphid; the 'fly' of the herdsman a gad; while to the citizen almost anything to be seen with wings (except pigeons and sparrows) is a fly. There are some, again, to whom flies are *flies*, one fly *the* fly, the common well-known little black house-fly. Here at last is something definite. No, not even now; for these will, at least, claim their young house-fly, and their full-grown house-fly, and expect you to believe that late in the year their house-fly takes to biting you, little dreaming that the little fly, and the big fly, and the fly which bites you, not only are different species but even belong to different genera; that the little fly never grows big, that the big fly never was little, and that their house-fly could not bite you if he would. What, then,

are we to understand by the name fly? It is clear that the popular sense has no sense at all, or too many senses, and yet the word cannot be spared from our vocabulary. In any Latin dictionary we shall find *Musca* (fly), and the entomologist pounces upon it and says it shall mean the tribe of two-winged insects. Linnæus so used it, and his genus *Musca*, now broken up into many new genera, represented the greater number of those insects which the entomologist now claims as flies."

In some parts of the work there is rather a tendency to jump at conclusions, and to give explanations of very doubtful value. It is attempted, for instance, to explain why the bee has four wings instead of two, by the fact that it is necessary for them to fold up and pack into a small compass to avoid injury and be out of the way during work, and this it is said is "the purpose of the division of the wing." This conveys the entirely erroneous



TRANSFORMATIONS OF THE DRAGON-FLY

impression that the wings of insects are normally two, and that the four are formed by the "division" of these two, an impression which we feel sure a person so well informed as the author could not have meant to convey. It also seems carrying hypothetical life-history a little too far to say of a bee emerging from the pupa that "into his mind rushed a full sense of his responsibilities," and on finding himself, say, a worker, "he, or rather she, be-

came aware that the duties of house-builder, housekeeper, nurse, and even soldier and sentinel, devolved upon her;" and accordingly she forthwith "addressed herself to the task of repaying to futurity that debt which the cares of a former generation had laid upon her, and daily she toiled in its fulfilment." To make this exposition of the mental state of the newly-born bee complete, we should have been told whether it regulated its conduct in doubtful cases

according to the utilitarian or the intuitive theory of morality.

Such vagaries as the above are however rare, and we can conscientiously recommend this book as admirably adapted to lead its readers to observe for themselves the varied phenomena presented by insects, and thus to become true entomologists. ALFRED R. WALLACE

AMERICAN GEOLOGY

Preliminary Field Report of the United States Geological Survey of Colorado and New Mexico. Conducted under the authority of the Hon. J. D. Cox, Secretary of the Interior. By F. V. Hayden, United States Geologist. 8vo. pp. 155. (Washington: Government Printing Office, 1869.)

THIS preliminary field report makes us acquainted with a vast tract of territory hitherto scarcely known, save to the more adventurous squatters and to the various tribes of Indians who have gradually been driven farther and farther west by the wonderful growth of the United States populations, fed as they are annually by streams of English, Irish, Scotch, and German emigrants. Unfortunately for the Red-skins, they are not only hemmed in on the one side by the United States, and on the other by the equally vigorous growth of California and its vast mining and agricultural population; but their territory, only hitherto invaded by the Mormons and the "Pony-Dispatch," is now cut in twain by the great Pacific Railroad, which, in its course, has sent forth geological reconnaissances right and left, discovering timber here, coal there, building stone in this spot, mines in that, until there is no space left for them save in the happy hunting-grounds above, to which they are fast going, aided by revolvers, alcohol, and disease.

The report refers to a line of country extending from British North America to New Mexico in a northerly and southerly direction, and from the Rocky Mountains to the Lower Missouri in an easterly and westerly one. Dr. Hayden explains the reason why he has been able in a very short time to cover so large a tract of territory—it is, that "there is great uniformity in the geology of the country, and when one has become familiar with the different geological formations over a small area, he can trace them with great rapidity over long distances" (p. 11).

First, we have the Rocky Mountain system forming the main ridges and the hills, composed of granite rocks. Resting on the flanks of these more elevated masses, the stratified deposits are exposed in succession, becoming less and less inclined as we recede from them and enter the plains.

The oldest stratified deposit met with is the Potsdam Sandstone, equivalent in geological position to our Upper Cambrian, or to the Primordial Zone of Barrande; this is followed by strata of Carboniferous age, but giving no promise of workable seams of coal. The Triassic series may be represented by certain red arenaceous deposits, sometimes containing gypsum and rocksalt; these pass upwards into undoubted Oolitic beds. Next follows a Cretaceous formation, some 4,000 feet in thickness, followed by a well-developed Tertiary series of vast geographical extent, and but very slightly inclined.

These Tertiary beds are rich in lignites, and evidence a long period of tranquil estuarine or lacustrine deposition in a region supporting dense forests of large trees, and a vegetation far exceeding in luxuriance anything now met with in these latitudes. Carnivores, Pachyderms, Proboscidea, &c., occur in great abundance. It is very interesting to know that in Tertiary times North America had its elephants, hippopotami, rhinoceroses, horses, lions, &c., and was, in the size and abundance of its Mammalia, in no way surpassed by the Continents of the Old World.

Two minor reports accompany Dr. F. V. Hayden's report, one on "Mines and Mining," by Mr. Persifer Frazer, jun., giving a most interesting account of the mining capabilities of the district; the other on the "Agriculture of Colorado," by Mr. Cyrus Thomas. There is every prospect of the Colorado territory becoming as rich an agricultural district as it has already proved to be a mining one. H. W.

OUR BOOK SHELF

Aunt Rachel's Letters about Water and Air. (London: Longmans and Co., 1871.)

IN the form of a series of familiar letters from an aunt to a nephew and niece, we have here an account, in simple familiar language, of some of the commoner physical phenomena of nature. Recollecting the books with a similar aim that have passed through our hands, we feel grateful to find one free from conspicuous blunders. To the little book before us we need not however apply such negative praise. It is in all respects to be commended as a book to put into the hands of the young. And we fancy that even many well-educated people who are not young in years, will find a record and explanation of facts with which they are not familiar. They may learn here all about the formation of ice, latent and specific heat, the air-pump, the barometer and thermometer, the winds, combustion, and many other phenomena of daily life. A few well-executed woodcuts illustrate the text; and we would like to hear that a large circulation has rewarded the efforts of "Aunt Rachel" to popularise the elements of science.

Handbuch der allgemeinen Himmelsbeschreibung vom Standpunkte der kosmischen Weltanschauung dargestellt. Von Hermann J. Klein. Pp. 351. (Braunschweig, 1871. London: William and Norgate.)

Theoretische Astronomie. Von Dr. W. Klinkerfues. Erste Abtheilung. Pp. 256. (Ditto, ditto.)

THE first of these works is the second edition of the first part of a general description of the universe, and is devoted to the solar system: another part will be given to the fixed stars. The aim of the author is to afford a complete account of his subject, including the latest researches, which shall be at the same time thoroughly scientific, while it will not be beyond the comprehension of those who are possessed of only an elementary knowledge of astronomy, or more properly perhaps uranography. The first forty-nine pages contain a description of the sun; the next five are given to the zodiac. Then follow the planets Mercury, Venus, &c., in order, and finally we have a full and very interesting account of comets and meteorites.

Turning to the chapter on the sun, we find, after a general introduction, methods for calculating the distance between the centre of the sun and that of the earth. After this we have an account of the "spots," accompanied with tables of their numbers in different years, and their connection with the movements of the magnetic needle. The labours of Herschel, Airy, Lockyer, Huggins, and others are largely quoted, and the author begs any ob-

according to the utilitarian or the intuitive theory of morality.

Such vagaries as the above are however rare, and we can conscientiously recommend this book as admirably adapted to lead its readers to observe for themselves the varied phenomena presented by insects, and thus to become true entomologists. ALFRED R. WALLACE

AMERICAN GEOLOGY

Preliminary Field Report of the United States Geological Survey of Colorado and New Mexico. Conducted under the authority of the Hon. J. D. Cox, Secretary of the Interior. By F. V. Hayden, United States Geologist. 8vo. pp. 155. (Washington: Government Printing Office, 1869.)

THIS preliminary field report makes us acquainted with a vast tract of territory hitherto scarcely known, save to the more adventurous squatters and to the various tribes of Indians who have gradually been driven farther and farther west by the wonderful growth of the United States populations, fed as they are annually by streams of English, Irish, Scotch, and German emigrants. Unfortunately for the Red-skins, they are not only hemmed in on the one side by the United States, and on the other by the equally vigorous growth of California and its vast mining and agricultural population; but their territory, only hitherto invaded by the Mormons and the "Pony-Dispatch," is now cut in twain by the great Pacific Railroad, which, in its course, has sent forth geological reconnaissances right and left, discovering timber here, coal there, building stone in this spot, mines in that, until there is no space left for them save in the happy hunting-grounds above, to which they are fast going, aided by revolvers, alcohol, and disease.

The report refers to a line of country extending from British North America to New Mexico in a northerly and southerly direction, and from the Rocky Mountains to the Lower Missouri in an easterly and westerly one. Dr. Hayden explains the reason why he has been able in a very short time to cover so large a tract of territory—it is, that "there is great uniformity in the geology of the country, and when one has become familiar with the different geological formations over a small area, he can trace them with great rapidity over long distances" (p. 11).

First, we have the Rocky Mountain system forming the main ridges and the hills, composed of granite rocks. Resting on the flanks of these more elevated masses, the stratified deposits are exposed in succession, becoming less and less inclined as we recede from them and enter the plains.

The oldest stratified deposit met with is the Potsdam Sandstone, equivalent in geological position to our Upper Cambrian, or to the Primordial Zone of Barrande; this is followed by strata of Carboniferous age, but giving no promise of workable seams of coal. The Triassic series may be represented by certain red arenaceous deposits, sometimes containing gypsum and rocksalt; these pass upwards into undoubted Oolitic beds. Next follows a Cretaceous formation, some 4,000 feet in thickness, followed by a well-developed Tertiary series of vast geographical extent, and but very slightly inclined.

These Tertiary beds are rich in lignites, and evidence a long period of tranquil estuarine or lacustrine deposition in a region supporting dense forests of large trees, and a vegetation far exceeding in luxuriance anything now met with in these latitudes. Carnivores, Pachyderms, Proboscidea, &c., occur in great abundance. It is very interesting to know that in Tertiary times North America had its elephants, hippopotami, rhinoceroses, horses, lions, &c., and was, in the size and abundance of its Mammalia, in no way surpassed by the Continents of the Old World.

Two minor reports accompany Dr. F. V. Hayden's report, one on "Mines and Mining," by Mr. Persifer Frazer, jun., giving a most interesting account of the mining capabilities of the district; the other on the "Agriculture of Colorado," by Mr. Cyrus Thomas. There is every prospect of the Colorado territory becoming as rich an agricultural district as it has already proved to be a mining one. H. W.

OUR BOOK SHELF

Aunt Rachel's Letters about Water and Air. (London: Longmans and Co., 1871.)

IN the form of a series of familiar letters from an aunt to a nephew and niece, we have here an account, in simple familiar language, of some of the commoner physical phenomena of nature. Recollecting the books with a similar aim that have passed through our hands, we feel grateful to find one free from conspicuous blunders. To the little book before us we need not however apply such negative praise. It is in all respects to be commended as a book to put into the hands of the young. And we fancy that even many well-educated people who are not young in years, will find a record and explanation of facts with which they are not familiar. They may learn here all about the formation of ice, latent and specific heat, the air-pump, the barometer and thermometer, the winds, combustion, and many other phenomena of daily life. A few well-executed woodcuts illustrate the text; and we would like to hear that a large circulation has rewarded the efforts of "Aunt Rachel" to popularise the elements of science.

Handbuch der allgemeinen Himmelsbeschreibung vom Standpunkte der kosmischen Weltanschauung dargestellt. Von Hermann J. Klein. Pp. 351. (Braunschweig, 1871. London: William and Norgate.)

Theoretische Astronomie. Von Dr. W. Klinkerfues. Erste Abtheilung. Pp. 256. (Ditto, ditto.)

THE first of these works is the second edition of the first part of a general description of the universe, and is devoted to the solar system; another part will be given to the fixed stars. The aim of the author is to afford a complete account of his subject, including the latest researches, which shall be at the same time thoroughly scientific, while it will not be beyond the comprehension of those who are possessed of only an elementary knowledge of astronomy, or more properly perhaps uranography. The first forty-nine pages contain a description of the sun; the next five are given to the zodiac. Then follow the planets Mercury, Venus, &c., in order, and finally we have a full and very interesting account of comets and meteorites.

Turning to the chapter on the sun, we find, after a general introduction, methods for calculating the distance between the centre of the sun and that of the earth. After this we have an account of the "spots," accompanied with tables of their numbers in different years, and their connection with the movements of the magnetic needle. The labours of Herschel, Airy, Lockyer, Huggins, and others are largely quoted, and the author begs any ob-