not also just. It would appear, not only that this dog must have thought her plan through, but that she must also have held it definitely in mind for several days while she executed it, thus indicating quite unequivocally, it seems to me, that one animal at least, ranked lower than man, possesses the power of looking into the future and of executing plans deliberately laid with reference thereto; "man is the only animal which has the power of looking into the future," to the contrary notwithstanding. F. H. KING.

River Falls, Pierce county, Wis.

Method for making electrical signals.

When I first became connected with the Alabama agricultural and mechanical college, the recitation signals were made by means of electric bells, one in

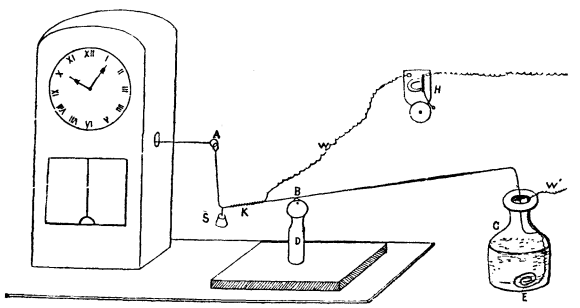

FIG. 1.

each professor's room. These were rung separately by pressing in succession as many push-buttons as there were bells. In order to complete the system, it was necessary to have one wire for each bell, and a return-wire running through the whole length of the system; and therefore only *one* bell could be rung at once. In the circuit there were twelve bells, about one-half mile of wire, and twelve one-gallon cells of Watson's battery. One of the cadets of the college was delegated to sound the signals at the end of each fifty minutes, which was the length of the recitation hours. Sometimes he would ring too soon, and at other times several minutes too late. This was frequently annoying, particularly when an interesting

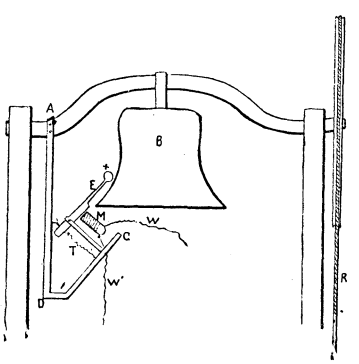

FIG. 2.

and important lecture was in progress. In the attempt to obviate this difficulty, the plan that I am about to describe was suggested to my mind.

We have an excellent compensated clock that can be made to strike twice any multiple of five minutes. After adjusting this clock so as to make it strike every fifty minutes, I insulated it on a square of plate glass. I then made an oblong opening in the side of the woodwork about one inch long. This slit was made on a line with the ball of the striker. Through this hole I passed a copper wire, and fastened it securely to the hammer of the gong. In the end of the wire outside of the clock I made a loop, as shown at *A*, Fig. 1.

A second wire, *A B C*, was attached to the first, as shown in the figure. A loop at *B* fits in a slit in the upright *D*, and a pin is inserted at *B* to hold the wire in position and at the same time allow the ends *A* and *C* to work up and down when the hammer of the clock strikes. The bottle *C E* is partly filled with mercury. From this mercury-cup a wire, *E W*, runs to one pole of the battery. The other pole connects at *K* with the wire *W*, after passing through all the bells of the system. *S* is a weight to counterbalance the arm *B C*. It will be readily seen that the outward stroke of the hammer will throw the end of wire *A B C* into the mercury, thus completing the circuit, and causing all the bells to ring. The blow of the hammer against the gong of the clock will raise the end *C*, and break connection. All but one of the bells must be single stroke: otherwise it will be impossible to obtain satisfactory results. By using one bell, with attachment for breaking and closing the circuit, the ringing will continue as long as the wire at *C* is in contact with the mercury.

The above system has been in operation for one year, and has given satisfactory results.

It has occurred to me that our large bell, weighing nearly two thousand pounds, can be made to strike the hours for the benefit of the town by placing it in the system just described, with the following adjustment. Procure a soft iron horseshoe magnet six or eight inches long, and secure it at *M* on the iron rod *A D C*, Fig. 2. This becomes magnetized when the clock completes the circuit. The armature *X Y* is attracted, and the ball *X* strikes the bell. The elasticity at *E* raises the ball immediately from contact, and allows a clear and distinct ring. The tension-spring *T* raises the armature from the magnet, and the current ceases to flow. If it is desirable at any time to ring the bell in the ordinary way by means of the rope *R*, the adjustment of the system may be sustained by making the supporting rod *A D C* secure to the bell-shaft at *A*, and thus permitting the magnet and fixtures to swing with the bell.

P. H. MELL, Jun.

Auburn, Ala.

GEIKIE'S GEOLOGY.

Text-book of geology. By ARCHIBALD GEIKIE, LL.D., F.R.S., director-general of the Geological survey of Great Britain and Ireland, etc. With illustrations. London, *Macmillan & Co.*, 1882. 971 p. 8°.

TEXT-BOOKS in science once held a rather low place in the estimation of scientific men. Labor of this sort was long relegated to the book-makers, who, copying statements and illustrations one from another, gave the student more of the errors of by-gone days than of the knowledge of their own. But in our own time all this has been greatly bettered. Now a man

of science is likely to look forward to text-book making as a source of honor as well as of remuneration; as a task that may not only help others on their way, but aid himself to a broader and more careful view of his own field of labor. The text-books of Lyell, Jukes, and Dana in geology are among the admirable works of these great authorities, and were doubtless helpful to them in their careers, as they have been vastly advantageous to those who have been trained by them. From a purely literary point of view, text-book making has no mean value to their makers. To collect the stores of learning of a science, to take that which has general value from the mass of details, to secure a due proportion and perspective to the parts of the work, — this is a task indeed.

Mr. Geikie has proven himself strong enough for this burden. His store of facts is far larger than has hitherto been gathered in any one book on geology. They show a large general reading, not only in the vast geological literature of his own island, in the making of which he has had a large share, but in the work done in other lands, — a praise that can be given to few of his countrymen. In his list of authorities he gives more names of scientific men of other countries than of British geologists; and this although he professedly desires to take his illustrations as far as possible from his own ground.

Besides the peculiarly large amount of well-gathered fact that marks this work, we may note among its peculiarities the considerably wider range in the method of treatment of the subject. In his first book he gives twenty-four pages to the cosmical relations of the earth, and under this heading presents the fullest and most satisfactory statement of the general condition and history of the earth as a member of the solar system that has yet been given in a popular treatise. With the same freedom of treatment, he does not hesitate to give a much fuller discussion of mineral veins than has hitherto found its way into any text-book. So, too, with those portions of the text that treat of river-action, volcanic phenomena, and the other leading manifestations of the geological forces. The author evidently feels a sense of freedom in making his book that is to be commended even if it gives him in the end near a thousand pages of text.

The paleontological part of the work is carefully done, but it is in the nature of the subject that it should be less commendable than the other parts of the book. There is a radical difficulty in treating paleontology, especially in its department of historical geology, in any text-book fashion. Even within the ample limits given by a thousand pages of print it comes down to a list of specific names that can only convey a meaning to the masters of the science; while the first principle of a text-book should be, that any statement should have a free comprehensibility within itself, without recourse to libraries or collections. Page after page of specific names hinders rather than helps the beginner.

This is the only criticism that can be made on the historic geology of the book, and it is one that lies against all the text-books that have thus undertaken to treat a subject that is so essentially unfit for this use. The essays on the divisions of the rock series are admirable. Especially to be commended is that on the old dispute concerning Cambrian and Silurian. It is pleasant to find a successor of Murchison in the directorship of the British survey who can do even-handed justice to the famous dead who fought this great battle over the division of the lower paleozoic section.

At several other points in the series of rocks we find an excellent spirit of discrimination applied to the problems of stratigraphic geology. We note the following. In discussing the relations of Permian to carboniferous rocks, the author notes the important fact, that, while in Europe there are discordances and sharp contrasts between the Permian and the carboniferous series, there is no such trenchant line in America. In the same spirit the indistinctness of the line between the triassic and the Jurassic series in North America is carefully pointed out. We find, also, that the doubt concerning the position of the Flysch series of the Alps is well presented; the ground being taken that the lower part of this series is upper cretaceous, the higher portions, eocene. This is the best brief presentation of this important problem that is known to the present writer. The only important exception that we can take to this admirable presentation of the stratigraphic problems concerns the author's general treatment of the triassic period. He notes that the European triassic series, with its reddish sandstones and shales, with connected gypseous and rock-salt beds, is essentially local in character, and that this aspect of the series cannot be expected in foreign lands. To this no objection can be taken; but he fails to assert the equally important fact, that reddish sandstones and shales have a singularly wide distribution in other lands. This general character of the trias constitutes it one of the most puzzling portions of the geological section, and

it should be given its due prominence in any general account of the series.

The last eighteen pages of the book are given to the chapter on physiographic geology.

This matter belongs in close relation to the earlier chapters of the book, and seems somewhat isolated in its position. It is not so completely treated as the other parts of the book; but it is, nevertheless, a fair condensation of the most material points of the subject. The illustrations of this subject are rather limited, but a diagram of the Colorado Canyon by Mr. Holmes (p. 923) gives a peculiar value to the set of diagrams.

It is hardly fair to quarrel with the title of so good a book, but it would have been better to have given it the name of a manual rather than a text-book. It is not fitted for the ordinary use of schools; being far too rich in matter, and calling for too much collateral knowledge for classroom work. It belongs in association with Dana's classic manual of geology. For American students it cannot replace that admirable book; but, taken along with the American work, it will give the student a very complete encyclopaedia of geologic science.

The book is fairly well made. The type is bolder-faced than in Dana's manual; so that the total amount of matter is about the same in the two books, despite the somewhat larger page of Geikie's volume. An admirable feature of the book is the free use of footnotes referring to authorities, which is a distinct advantage the book has for the student. The figures are well chosen, and finely serve their purpose; though there are not quite half so many as in Dana's work.

The index is voluminous and well made.

HAECKEL'S CEYLON.

Indische reisebriefe. Von ERNST HAECKEL. Berlin, *Paetel*, 1883. 13+356 p. 16°.

A visit to Ceylon. By ERNST HAECKEL. Translated by Clara Bell. Boston, *Cassino*, 1883. 8+337 p. 16°.

IN his 'Voyage of the Beagle,' Darwin has shown that an acquaintance with nature does not in the least detract from the interest of a traveller's adventures. Haeckel, in his new book on Ceylon, has still further given evidence that a love for nature's treasures adds an indescribable charm to one's wanderings in a strange land. In the 'Indische reisebriefe' we find a charming account of a scientific pleasure-excursion which the author made during the six months following October, 1881. The journey included a brief stay at Bombay, and a much longer series of travels through Ceylon, covering a space of four months.

Upon reading the book, the first impression we get is, that Haeckel must be a most pleasant travelling-companion, so delighted is he with every thing. He starts, he tells us, on a trip he has been longing for all his life, and evidently with the expectation and intention of having a delightful excursion. Nor will he allow any thing to frustrate his intention. It makes no difference where he is, or who are his companions: his good nature is unbounded. Every one, he seems to think, treats him with more than kindness; the roads he travels are models of comfort; and even the elements conspire in his favor. The country he passes through calls forth the whole wealth of the German language to find adjectives sufficient to express his boundless admiration. Officials give him every assistance; private homes open to him with the kindest hospitality; and even the natives take great interest in him, and are ever ready to give him aid which is at least kindly intended. When he establishes his laboratory at Belligam, he is supplied with servants, to whose excellency he can only do justice by naming one Socrates, and a second Ganymede. Belligam, the name of the town where he established his laboratory, means 'sand-village.' This name, however, does not suit Haeckel's general delight; and he calls it Bella gemma, considering it as 'a choice jewel in nature's casket.' An ordinary trip in the tropics is thus, by good nature and enthusiasm, transformed into a glowing journey through fairy-land. Indeed, one almost imagines, as he reads, that he has found an American advertisement of a pleasure-excursion. So full of pleasure and good fortune is the whole trip, that the reader soon grows weary, and wishes that some slight accident might happen, to break the monotony. It is certainly a relief to find the admission that the fauna of the island is disappointing; and we are quite reconciled to the fact, that the scientific laboratory was not quite so successful as had been hoped.

Haeckel's style in this book, as indeed in all his writings, is a most happy one. He gives what may be called a confidential description of nature where it is most lovable. The reader gets the impression that it is being given him in person by the author, for the purpose of enjoying once more the pleasures of the journey, and having a quiet laugh at the people. He cannot keep himself out of his descriptions, — indeed he does not try to do so; and what we see on every page is not a picture of Ceylon, but a picture of a man, making a journey through