Lindl. sp., and P. Reinii Geyl. The fresh-water or brackish character of these deposits is proved by the occurrence of true and undoubted Cyrena sp. and Estheria.

The cretaceous fossils of Yesso are carefully examined by Naumann (*Mitth. deutsch. ostasiat. gesellsch.*, heft 21), and partly (thirteen species) identified with Indian types, partly with shells described by Schmidt, from Sachalin. His result is, that the Ammonite-beds of Yesso are upper-cretaceous, and correspond especially to the Ootatoor-group of India.

During the last vacation, I got, from Shikoku, sandstones which are also upper cretaceous. They are quite filled with a Trigonia of the scabra-group, probably T. aliformis Park. Two other Trigoniae, which I cannot determine with the literature at hand, fragments of Natica and Hamites, accompany it. The said sandstones have been met with at Oruno, district of Itanagori, province of Awa; Tannomura, district of Katsuragori, province of Awa; Yassudamura, district of Akigori, province of Tosa, — on the island of Shikoku.

The tertiary strata are rather thick. Those which have been studied by Dr. Brauns (*Mem. Tokio univ.*, no. 4, 1881) and A. Nathorst (*Svensk. akad. handl.*, 1882) are pliocene, most of the shells and plants described being identical with living ones. Miocene, or older strata, are not yet recognized with certainty.

Glacial phenomena have not left any traces in Japan.[1] I conclude here with the remark that the list of your *Explication* contains some volcanoes (nos. 8 and 9, p. 114; nos. 4 and 10, p. 115) which I cannot make out. More complete are the lists of Naumann (Yokohama, 1878) and Milne (*Trans. seismol. soc. Japan*, iv. 1882): but even these are not complete; for a recent revision I made gave forty-eight volcanoes which are active now, or have been active within historical time, or are still in the solfatara state. Besides that, I know about forty cones which are probably prior to human record, and date back as far as the pliocene series, which is very often tufaceous or filled with pumice-fragments.

PERFECT INTERFERENCE OF SOUND BY TELEPHONE.

SUPPOSE we have two telephones having the poles of their magnets similarly placed, and so connected with a circuit that a current will traverse their coils in the same direction. It is evident that any electric current passing will cause a simultaneous movement in the same direction in the diaphragms of both telephones. Now, if we conceive the current reversed in one of the telephones, the motions will have opposite signs. It follows, then, that the currents due to the vibration of the diaphragm of a third telephone in the circuit will produce in the two telephones vibrations of *opposite phases;* the sounds produced, therefore, will differ by a half-wave length. The same current which in one telephone produces a condensation will in the other produce a rarefaction.

The experiment, as successfully tried in the physical laboratory of Dartmouth college by Professor Emerson and myself, was arranged as follows: the mouths of two similar telephones were placed before the extremities of a Y-shaped tube, and the sound from both telephones conducted to the ear by rubber tubing. A reversing-switch was placed in the circuit, by means of which the direction of the current in one of the telephones could be changed; in this way could be produced at will coincidence or interference of sound. Each branch of the Y-tube was of rubber, so that either arm could be closed by pinching. Organ-pipes of various lengths were sounded near a telephone in a neighboring building. It was found, that, when arranged for interference, the pinching of either of the branch-pipes produced a very decided increase in the intensity of the sound; when reversed, an equally decided decrease. The inequality in the intensity of the sounds due to the two telephones was found to be the chief difficulty in producing complete interference; but by partly closing one branch, so as to weaken the stronger sound, the effect was much improved. In several trials the interference was complete, no sound whatever being audible. The rapid reversal by the switch gave a sharp contrast between the strengthening and the weakening effect.

This method of demonstrating the phenomenon of interference has obviously the advantage of applicability to sounds of any pitch. With singing, the interference was very satisfactory, especially with the lower notes; in conversation, however, the sound is not so much weakened, but the quality is perceptibly changed. The vowels seemed to suffer much more than the consonants. C. S. COOK.

[1] The writer ignores the discovery of Prof. J. Milne of the engineering school of Tokio, at the large mountain of Gwassan, northern part of Nipon, where are large bowlders and *roches moutonnées*, — the product of glacial action. — J. M.

RAILWAY-ACCIDENTS IN 1882.

THE statistics of railroad operation in this country are far too incomplete and unreliable to admit of drawing any very general conclusions. Certain facts, however, appear with sufficient distinctness to show some very grave defects in the system under which our roads are worked. The *Railroad gazette* publishes monthly and annually a list of accidents to trains while in motion. This, however, does not include over twelve per cent of the whole number of casualties. Again, accidents not resulting in loss of life or in serious damage to property are rarely recorded; though in many cases the blame is not less great, and the lesson conveyed not less important. The total number of train-accidents for the past ten years is returned as below; the second horizontal column showing the actual number, and the third column the number per thousand miles of road in operation: —

1873	1874	1875	1876	1877	1878	1879	1880	1881	1882
1,283	980	1,201	982	891	740	910	1,078	1,458	1,365
18.3	13.6	16.2	12.8	11.3	9.0	10.6	11.6	13.9	12.4

If we regard the second line alone, the figures would seem to be sufficiently discouraging, as there is a steady increase in the number of accidents from 1878 to 1881. We must, however, take into account the growth of the railroad-system. This is done in the third line; and here, again, while we find a somewhat less rate of increase, the fact still remains, that our roads are not growing safer as they expand in extent.

If we examine in detail the causes of accidents, we shall see that they are less dependent upon the total length of roads in operation, than upon the density of the traffic; in accordance with the law, that failures of track and bridges are approximately in proportion to the length of road, while the number of collisions is in proportion to the square of the number of trains.

Thus for the past ten years the number of collisions was as shown in the second line below, the number of derailments as in the third, and the number of broken bridges as in the fourth: —

1873	1874	1875	1876	1877	1878	1879	1880	1881	1882
392	260	278	279	268	220	310	437	536	581
815	655	840	655	581	481	557	597	857	742
19	33	26	20	21	21	17	16	44	38

While the length of railroads increased from 70,000 miles in 1873, to 110,000 miles in 1882, the whole number of accidents decreased steadily, from 1,283 in 1873, to 740 in 1878, and then increased to 1,365 in 1882; while the number of collisions ranged from 392 in 1873, to 220 in 1878, and then steadily increased to 581 in 1882. Moreover, this increase in collisions is shown very plainly to be due to the crowding of the tracks, as the butting collisions range from 102 in 1873, to 70 in 1878, and from that number to 160 in 1882; while the rear collisions run from 187 in 1873, to 142 in 1878, and from that number to 388 in 1882. Comparing the accidents month by month, we find two periods when disasters are most numerous; viz., the first quarter of the year, and the three months August, September, and October. The accidents during the first quarter are very largely due to the extreme cold of that season, — the total disasters from broken rails in the ten years above having averaged six times as many during the first quarter as in July, August, and September. Indeed, we can always detect the unusually cold winters by the number of broken rails. The disasters of August, September, and October are supposed to be due to the crowded state of the roads during the excursion-season, when a large number of irregular trains are run.

It is hard, from the imperfect records at our command, to draw such definite conclusions as would enable us to improve the condition of affairs upon our railroads; but the statistics recorded by the Gazette are of great value as far as they go, and will eventually furnish the data we need for increasing the safety of railway-travel. GEORGE L. VOSE.

LETTERS TO THE EDITOR.

A caterpillar-eating hen-hawk.

IN July, 1882, my nephew Malcolm Storer, being at Moosehead lake, had the curiosity to examine the stomach of a hawk which he had shot there, and was surprised to find that it contained a large number of caterpillars in all stages of decomposition through digestion. Though the examination was made soon after the bird was shot, none of the caterpillars were found alive; but ten or twelve of them were perfect, and fifteen or twenty could still be distinguished as caterpillars in the mass of more completely digested matter. It was evident, moreover, that the stomach contained no other kind of food. The caterpillars were of green color, with yellowish rings or blotches, and were as thick and almost as long as a man's little finger. The wings of the bird, having been brought to Cambridge, were found to be those of the broad-winged hawk (Buteo pennsylvanicus). In view of what is known of the food of hawks, it is not at all strange that they should regale themselves upon caterpillars when opportunity offers. The marsh-hawk (Circus hudsonius), for example, is said to be 'an indiscriminate feeder upon fish, snakes, and even worms;' and many other hawks are known to feed upon snakes occasionally, as well as upon lizards, in regions where they are to be had. The fact that both large hawks and small devour many insects, such as crickets and grasshoppers, has often been noticed.

F. H. STORER.

An Indian burial-mound.

At my request Mr. Frank La Flesche, an educated Omaha, made inquiries of the older men of his tribe about the burial of the famous Omaha chief Big Elk, who died about 1825. He writes me as follows: "In compliance with your request, I made inquiries about the mound made by the Omahas, in which Big Elk was buried; and was told that it was about as high as the shoulders of a tall man standing up, and that he was buried with great ceremonies. His favorite horse was strangled to death by his grave, and most of his horses and household goods were given to the poor. The place where he is buried is known by the Omahas as 'Big Elk's grave,' but by the whites as 'Black Bird hills,' as Black Bird was buried in the same place. It is said that Black Bird was buried with very little ceremony, as he died when the Omahas were being very much troubled with the small-pox; and he was *not* buried riding a live horse, as stated by some. A grandson of his is still living, and is about one hundred years old; and he thinks his grandfather died before he was born."

As we have very few reliable records of the erection of burial-mounds by Indians since the settlement of the country by the whites, the statements quoted above are of considerable importance; but these facts do not prove that all mounds are recent, or that all were made by the immediate ancestors of the Indian tribes which still erect mounds over their noted dead; any more than, for the same reason, they prove that the Omahas and other recent mound-building tribes are of the same stock with the ancient Greeks. The custom of raising a mound of earth or of stones over a grave is world-wide, and must not be taken for more than it is worth in archeology. There are so many kinds of mounds in this country, that it shows a limited experience in their investigation when a writer here and there asserts that they are all the work of the present Indians, or their immediate ancestors; and an equal disregard of known facts, when another as confidently asserts that they were all made by a people unlike and superior to the Indian race, and of great antiquity. Each earthwork, mound, and burial-place should be investigated and studied by itself. Side by side we may find earthworks entirely different in their character, and to be assigned to very diverse ages; so we may find burial-mounds of the same character near together, one of which may be so recent as to contain glass beads and other things obtained by the Indians from the whites, while the other may be of great antiquity. Their proximity will not in itself prove that they were made by the same people. Much careful and systematic work has yet to be done before the question so often asked, Who made the mounds? can be satisfactorily answered. By a proper study of the mounds and earthworks of North America, facts will at last be accumulated by which an approximate determination of their chronology and relation to existing peoples will be made possible. In this work the Peabody museum has been engaged for several years, and during the past season most important results have been secured. F. W. PUTNAM.

Cambridge, Mass., Feb. 19.