frequently cut completely through the *névé* and expose the rock beneath to the action of frost. In such instances the rocks are in the best position possible to be acted upon by great changes of temperature. Dark bodies on high mountains absorb heat when exposed to the sun, although the air may be below 32° F.; and melting the adjacent snow, become saturated with water, which freezes as soon as they are in shadow. The blocks thus loosened fall away or are removed by the motion of the *névé*. The tops of the cliffs, however, are protected by a covering of snow. There is frequently a space above the top of the *névé* in summer which is exposed in like manner to the action of the atmosphere. These slopes recede by sapping through the action of frost, and precipices result. While the upper portions of the walls of depressions filled with *névé* snow are being broken away by the tensions in the *névé*, and by atmospheric action, the snow on the lower slopes is under compression, and thus rendered capable of abrading the rocks over which it flows.

The ice, in descending the steep slopes from various sides, impinges with great force on the bottoms of the depressions it occupies, and tends to scoop out rock basins. The result of these combined agencies is seen when the *névé* is removed, and we find amphitheatres with precipitous walls rising immediately above a rock basin lake. In other words, the resulting form is a *cirque* like those of the High Sierra.

So far as my observations extend, *cirques* are confined to mountains on which ice sculpture followed water sculpture. The topographic forms left after the disappearance of the ice are modifications of the antecedent forms due to the action of rain and streams.

In the vicinity of Mount St. Elias, Alaska, the mountain ranges are primarily monoclinal uplifts of geologically recent date, and do not bear evidence of having been deeply dissected by streams previous to the birth of the present glaciers. The ice drainage is largely consequent on the present orographic structure, and *cirques* are usually absent. One remarkable exception to this is furnished, however, by a fine *cirque* on the southern side of St. Elias, which is filled by *névé* snows and drained by a small glacier. Thousands of secondary and tertiary glaciers exist on the southern slopes of the mountains, but certainly very few, and so far as my knowledge goes none, of these have their origin in true *cirques*. On the north side of the mountains, however, which are in general the gently sloping surfaces of orographic blocks, topographic forms inherited from former aqueous erosion are conspicuous, and *cirques* are abundant.

Glaciers exist about the summit of Mount Shasta, Mount Ranier, Mount Baker, and other high volcanic peaks in the Cascade Mountains, but none of these, so far as known, originate in *cirques*. These mountains, like the uplifts about Mount St. Elias, are geologically young. They are volcanoes with fumaroles in their craters; and owing to their elevation, and the comparatively slight erosion they have suffered, it is reasonable to suppose that the first precipitation on their summits was in the form of snow. Glaciers were formed on unmodified slopes, but have not excavated *cirques* for themselves. The glaciers on these mountains, like many of the smaller ice streams in Alaska, occur on exposed slopes and not in depressions. The accumulations of snow and ice form prominent convex surfaces and frequently give a characteristic outline to the summits which they cover.

The probable origin of *cirques* which I have traced, together with the fact that they occur in thousands about the summits of mountains on which the glaciers followed water sculpture, together with their absence on unglaciated mountains like the Southern Appalachians, and also the fact that glaciers in themselves do not seem to have the power of excavating similar depressions, is seemingly cumulative evidence pointing to the conclusion stated above.

Cirques, alcoves, and possibly other forms, when considered simply as topographic features, may perhaps be classed together; yet, genetically, alcoves and *cirques* are distinct, the former owing their existence to aqueous sculpture, usually in horizontal rocks, and the latter to aqueous sculpture followed by ice sculpture, in rocks which may be heterogeneous or homogeneous, horizontal or inclined.

The generalization that "*cirques* are confined to glaciated regions," to which Mr. Bonney takes exception, was reached from considering the distribution of typical examples, previous to the differentiation of *cirques* from other similar topographic forms. When they are recognized as distinct from alcoves, and

necessarily in part of glacial origin, the reason for their distribution becomes evident, as does also the further generalization that they "occupy localities where glaciers first appear."

In the Rocky Mountains the peaks and ridges on which *cirques* occur have an elevation of from 10,000 to 14,000 feet. The same is true also in the Sierra Nevada. In each of these regions the ancient *névé* fields had generally about the same elevation, while the glaciers flowing from them descend to within 6000 or 5000 feet above sea-level. In Alaska, however, where the former glaciers descended into the ocean, *cirques* occur on peaks and ridges only 3000 or 4000 feet high, and examples may be found at elevations of less than 2000 feet. Their vertical, as well as their geographic range, therefore, appears to have been regulated by the climatic conditions which control the birth of local glaciers.

While "alcove" and "*cirque*" should have a definite significance in geology, amphitheatre, recess, bowl, and other correlative words, may be considered as general terms applicable to more or less inclosed spaces without reference to their origin. The semicircular recesses made by winding streams in the sides of cañons and deep valleys, sometimes resemble alcoves. Craters frequently bear a close topographic similarity to *cirques*, but are readily distinguished when their origin is considered.

On looking over my account of the *cirques* of the High Sierra (Eighth Annual Report, 1886-87, U.S. Geological Survey), I fail to discern any reason for materially changing it, except, as indicated above, to state more definitely the differences between *cirques* and other topographic forms with which they might be confounded.

I remain very sincerely your friend,

ISRAEL C. RUSSELL.

Large Meteor of January 24, 1892.

It is to be hoped that further observations will be forthcoming of the brilliant meteor of January 24, 10h. 55m. (described by Mr. T. Heath in your last number, p. 295), so that its real path may be computed. I think there is little doubt the meteor belonged to a shower of Draconids having a radiant-point a few degrees south-east of the star ζ . On the same night (January 24) as that on which the fine meteor was observed, I saw a third magnitude shooting-star, at 7h. 55m., with a path from $324^\circ + 40^\circ$ to $330\frac{1}{2}^\circ + 31\frac{1}{4}^\circ$, and this also belonged to the radiant in Draco. I discovered this shower on the nights of January 19 and 25, 1887, and determined the position of the radiant as at $261^\circ + 63^\circ$. There are many other showers from the same point in the spring, summer, and autumn months.

Bristol, January 31.

W. F. DENNING.

On the Relation of Natural Science to Art.

IN Dr. du Bois-Reymond's interesting lecture, as published recently in NATURE, there occurs the following passage (p. 226): "Flaxman" was "certainly mistaken in representing Polyphemus with three eyes—two normal ones which are blind, and a third in the forehead." Does not the recent discovery of a third (parietal) eye in some of the lizard and fish tribes (not to mention the tunicates!) diminish the force of this assertion? Flaxman's genius appears rather to have forestalled the discoveries of science in representing the human monster with three eyes, especially as Wiedersheim states that even in man nerve-fibres have been traced from the optic thalami to the pineal gland.

W. AINSIE HOLLIS.

Brighton, January 11.

Ice Crystals.

THE following account of some very well defined ice crystals may be of interest.

On December 26, 1891, the thaw set in. On the 27th, I noticed on the surface of the ice on the lake at Drinkwater Park, near Prestwich, on the outskirts of Manchester, a large number of very distinct, hexagonal, tabular crystals. The surface of the ice was not very wet. These crystals varied from half an inch to three inches across, were raised about an eighth of an inch above the surface of the ice, and in many cases bore a similar but much smaller crystal in the middle, raised about an eighth of an inch above the surface of the larger crystal. In some specimens the smaller crystal was rounded and indis-

inct. When it was absent, dark lines, following the direction of the lateral axes, were visible in some cases. Frequently an indistinct striation was present. GILBERT RIGG.

Manchester Museum, Mineralogical Department,
January 12.

A Tortoise inclosed in Ice.

I SHOULD like to be allowed to record a case of a water-tortoise surviving an incarceration in ice, somewhat similar to that given in NATURE (vol. xlv. p. 520).

In this instance, the tortoise has hibernated in a stone basin, in which there were about 6 inches of water and a quantity of dead leaves. The whole was, I believe, frozen into a solid mass. At any rate, when, on December 29, I examined a cake of ice and leaves, from 2 to 3 inches thick, which was floating in the basin after a thaw, I found the tortoise with its back embedded in the *under* side of the mass, and with nearly 2 inches of porous-looking ice above it. The animal, though torpid, was alive, and I replaced it in the basin. Later on it put its nostrils up to the surface, and two days afterwards was seen with its head out of the water as usual. It remained in the pond, which has been again frozen over, in less than a week after this observation. FRANK FINN.

31 Walton Crescent, Oxford, January 22.

Alpine Rubi.

In a footnote in NATURE (vol. xlv. p. 10) it is stated that "The two highest-known species of *Rubus* are *pinnatus* and *rigidus*, at 5000-6000 feet." This is hardly correct, unless it is intended to refer to African species only. In South America, *R. megallococcus*, *R. bolivienensis*, *R. bogotensis*, and *R. roseus* occur at 8000 feet, and *R. rusbyi* at 10,000. In Colorado I have found *R. strigosus* above 10,000 feet (see *Bull. Torrey Bot. Club*, 1890, p. 10; 1891, p. 169). In the Indian region, *R. ellipticus* goes to 7000, *R. lasiocarpus* to 8000, and *R. biflorus* and *R. rosifolius* to 10,000 feet.

The name of the wild *Zea* is *Z. canina*, Watson (local name, "mais de coyote"), not *nana*, as given in NATURE, vol. xlv. p. 39. T. D. A. COCKERELL.

Institute of Jamaica, Kingston, Jamaica,
December 30, 1891.

UTILIZATION OF HOMING PIGEONS.

THE utilization of the homing instinct of the domesticated varieties of the blue rock pigeon, the *Columba livia*, for military purposes, has been effected by most of the Governments in Europe. In France, Germany, Austria, Switzerland, Italy, Spain, and Portugal the organization has been very complete. It has even extended to Russia, Denmark, and Sweden; and Africa has been brought into communication with Spain by stations at Ceuta and Mellila. England alone, of all the great Powers, has neglected this important mode of communication, which is available under circumstances that preclude the employment of any other means.

It cannot be said that they have not been brought under the notice of the military and naval authorities. Nearly twenty years ago, on the occasion of the despatch of a flight of seventy-two birds from the Crystal Palace to Brussels, when the first birds arrived before the telegram which was sent to announce their departure, I wrote a letter to the *Times* of June 27, 1873, calling attention to their utility, and asking the question: "What would be the value of the birds, in the event of a war in which we may be engaged, that would convey messages to or from Guernsey, Jersey, and other places, when the submarine wires had been cut by the enemy?" and in a lecture delivered by me before the Royal Engineers' Institute at Chatham, on the use of pigeons for military purposes, I entered at some length into their mode of training and general utilization.

The employment of the *Columba livia* depends upon several conditions which are not without interest. In

the first place, this species is one of the comparatively few capable of domestication, a faculty which is totally distinct from, though frequently confounded with, the faculty of being tamed. A domesticated animal is attached to its home, and returns to it of its own will; a tame animal is merely familiar with man. These two states are admirably illustrated in the closely allied species, the fowl and the pheasant. Both were originally perfectly wild, but when domesticated the chickens invariably return home to roost, while the pheasants, though descended from numberless generations of birds bred in confinement, have no attachment whatever to the place of their birth or rearing.

In its natural habitat (the rocky cliffs of the sea-shore) the blue rock pigeon has to fly long distances in search of food, which, when breeding, it stores up in its crop and carries home to its young. This necessitates strong powers of flight and well-developed perceptive faculties, it being guided in its return solely by sight, and not, as is often supposed, by any special instinct.

The pigeons that are used for carrying messages are bred solely for that purpose. A process of artificial selection, as rigorous and remorseless as that of nature, is followed. The young birds, after acquiring their power of perfect flight, and learning the contour of the country in their circuits around their home, are taken in

FIG. 1.

the direction in which it is desired that they should fly, and trained stage after stage until they know every locality over which they have to traverse. This training is absolutely necessary, if their return home is to be depended on. During its performance the inferior birds, those whose intelligence and determination are not well developed, are lost; and the best birds, only, retained. This loss, in the long-distance flights which are flown by the Belgians and by the best homing pigeon societies in England, is very severe. Old birds, that know large tracts of country well, may be taken in new directions, provided they are not too extended, with safety, but young birds that have not been trained would almost certainly be lost if carried many miles from their home.

Every homing pigeon flyer recognizes the hereditary character of this acquired faculty, and will give a very high price for birds descended from parents that have flown long distances, whereas he would not purchase another bird of precisely similar appearance were he not acquainted with the performances of its ancestors. The fancy varieties of pigeons, especially those which are called carriers in England, are perfectly useless for the purpose of flying distances.

The birds that are most valued are almost all descended