

moved the antennæ, then the head, then the thorax, to and fro, and finally began to walk.

Formica nitidiventris.

(14) May 19, 4:08 p. m. Ant quiet, and confined in a test-tube as described in (13). Suspended the tube in the air near the rotating milled disk (12). At each sound from this apparatus the ant showed unmistakable signs of agitation, quickly moving the head and antennæ.

In addition to these, I may also mention an experiment tried on the colony as a whole with each of these species except *Formica nitidiventris*, with which I had no opportunity to try it. The colony being quiet in their nest under a plate of glass, I produced with the lips or with an instrument clear, shrill notes, taking the greatest care not to blow upon the nest or to allow anything else but the sound to disturb the colony. The ants instantly showed, by their quick movements in all directions, unmistakable signs of excitement or alarm. I tried this over and over again with each of the three species, in the presence of visitors to the laboratory, and the result was invariably the same. All who saw it admitted at once that their doubts as to the sense of hearing in those ants were entirely removed.

As to the remainder of the experiments, lack of space prevents me from describing them, but let it suffice to say that by far the greater part of them gave results just such as those already described.

The persistence of these affirmative results led me to a conclusion which is embodied in the statement of the following thesis: *The ants, or at least some of the ants, are capable of perceiving vibrations, conducted through the air or other media, which are audible as sound to the human ear.* It will be noticed that I do not assert that any of the ants hear, in the ordinary sense of the word; neither do I deny it; my statement is

merely that some of them are capable of *perceiving* ordinary sound vibrations, which does not necessarily imply a true sense of hearing. However, in all the experiments, great care was taken in various ways to prevent the vibrations from reaching the ants through solids as media. And if it be true that this sensation, apparently due to a sense of hearing, is merely that of a mechanical vibration or jarring produced by the sound waves (and hence would pertain in a measure to the sense of touch), how shall we explain the results of experiments like (3), (7), (9) and (11), which certainly indicate a sense of direction? And how shall we account for the fact, shown in many of my experiments, that some ants which pay little attention to being knocked and jarred about in their glass prisons are driven nearly frantic, apparently, by shrill sounds? The result of experiment (8) should also be noted as of special importance. For this ant (*Cremastogaster lineolata*) is a stridulating species, and the movement of the abdomen mentioned is one of stridulation, producing a minute sound; the significance of this fact is obvious, indicating a response on the part of the ant to the sound of the whistle.

I might proceed to discuss at length the results of these experiments, arguing from standpoints based on the principles of psychology; but for the present it will be necessary, as before stated, to leave the experiments with their results as described to the consideration of the reader, and permit him to deduce his own conclusions.

LE ROY D. WELD.

IOWA STATE UNIVERSITY.

ARE THE TREES ADVANCING OR RETREATING UPON THE NEBRASKA PLAINS?*

Two years ago I presented a paper before this Section showing that there are reasons

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for believing that the pines of Western Nebraska are advancing eastward in places where the fires have been kept out, and where cattle are not allowed to destroy, and man is himself not too actively engaged in the work of forest destruction. I have made further observations on these western pines, and while I have no doubt that there are places where they are dying out, I am certain that the general rule is that in western Nebraska and portions, at least, of the Black Hills of South Dakota, they are tending to advance, and that in many places they are actually advancing at a rate sufficiently rapid to be easily observed.

I have been studying the tree areas of eastern Nebraska, also, and find evidence which is still more conclusive that they are advancing with a good deal of rapidity. My personal observations have been in so many localities that it is impossible to specify them in detail in this paper. They involve most of the counties in eastern Nebraska. In practically every case where our travels up the streams, passing out to the side branches, to the little temporary rills which water the upper basins, the trees are of smaller size, and are much younger. It is a very rare occurrence to find large trees near the upper end of a forest belt. I have seen a few of such cases, but their rarity is such that one is always surprised when they are found. The general rule is that near the upper limit of the tree area there are many shrubs and mingled with them many young trees no larger than those which under cultivation are known to be not more than fifteen to twenty years old. I may cite the following localities from my notes: (1) on the head waters of Oak Creek in Butler County, (2) headwaters of the Blue River in Seward and Hamilton counties, (3) headwaters of Weeping Water Creek, in Cass County, (4) along small streams in the Loup Valley, (5) along the small streams north of the Platte in Sarpy

County, (6) headwaters of the little Nemaha Creek in Nemaha County.

I have asked some of the older settlers of the State in regard to this matter, and invariably they tell me that the trees have advanced up the valleys. One man says: "in our neighborhood the native timber has crept up the water courses in some places a mile or more, and in other places it has widened out from near the stream banks," and again in referring to a particular spreading area he says: "in the places where we played in the 'buffalo wallow' twenty-five years ago, there are now many large trees."

Another says that in 1872 very few of the 'draws' (*i. e.*, ravines) had any trees in them, but now where fire is kept out all are filled with timber. He says that on his farm which was originally swept with prairie fires, "I had a 'draw' where water was half the year, in which in 1883 there were no trees of any kind, while now there are willow, cottonwood, box elder and elms," and again, "the timber belt along the Nemaha River has widened from a hundred feet to half a mile and in some of the 'draws' it has run up from half a mile to a mile."

Another man speaks of a spot where "there is at present a fine lot of young timber of oak and hickory, where in 1876 there was nothing but brush; it is fully one hundred yards further up the stream than it was in 1876." He cites another case where the timber area has gone 'nearly half a mile up the stream.' He says that a fine grove of native timber through which I had passed a day or two before "was a brush patch in 1874, very few of the trees then being large enough for fishing poles," while now many of the trees are thirty or more centimeters in diameter.

Another observer records a grove consisting principally of oak trees from 15 to 30 centimeters in diameter and 18 to 20 me-

ters in height, occupying an area which a little more than forty years ago the owner used for a hay meadow.

I need not cite further cases. No one who has seen and studied the forest areas in eastern Nebraska, will be able to doubt that they are spreading where they are given a fair opportunity and are not prevented by man or his domestic animals.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

PRELIMINARY NOTE ON NEW METEORITES
FROM ALLEGAN, MICHIGAN AND
MART, TEXAS.

A LITTLE after 8 o'clock on the morning of July 10, 1899, there fell on what is locally known as Thomas Hill, on the Saugatuck road, in Allegan, Michigan, a stony meteorite, the total weight of which cannot have been far from 70 pounds, although unfortunately it was badly shattered in striking the ground and its exact weight can never be known. The main mass of the stone, which came into the possession of the National Museum, weighed $62\frac{1}{2}$ pounds, with an additional fragment weighing about $1\frac{1}{2}$ pounds. These with a 4 pound fragment sold to other parties, and very many small bits stated as varying from the size of a pea to that of a hickory nut, carried away by school children and others, would readily bring the total weight up to the figure mentioned. According to the as yet unverified statement of a paper, the fall was accompanied by a 'sudden report, like that of a distant cannon,' this being immediately followed by a rumbling rushing noise similar to distant thunder with the addition of a hissing noise. Eye witnesses of the fall describe the stone as descending in a nearly vertical direction with an apparently slight incline from north to west. A slight bluish tinge and hazy appearance was noted, but no luminosity, though that the stone must have been

highly heated in its passage through the atmosphere is proven by its being completely covered by a beautiful black crust, of about 2 mm. thickness. However this may be it was evidently scarcely more than warm when it reached the surface of the ground, for fibers of dry grass, leaves and roots which became firmly attached to its surface through impact, or even driven into crevices formed by the shock of striking the ground, were not charred in the least. The stone is reported to have been about 18 inches long and 12 inches thick, and to have buried itself in the ground by 18 inches where it fell. It was immediately exhumed, and is stated to have been 'still warm' when placed in the show windows of Messrs. Stern & Company, local clothing dealers.

The stone as received at the Museum is polyhedral in outline, one end badly shattered, the larger surfaces often somewhat convex, and as above noted covered with a thin black crust which is irregularly checked by contraction and the shock of the fall. The structure is chondritic, and the essential constituents olivine and an orthorhombic pyroxene (enstatite), together with very finely disseminated metallic iron and undetermined sulphides. A causal inspection fails to make certain the presence of feldspars. The stone therefore belongs to group 29, *Kügelchen Chondrit (Cc)*, of Brezina. The texture is very fine, and uniform throughout, the chondrules, often beautiful spherical, rarely exceeding 2 mm. in diameter. These are sometimes wholly of radiating enstatites, or again of idiomorphic olivines in a black glass. The mass is very friable, and though beautifully fresh and unoxidized, falls away readily to sand when pressed between the thumb and fingers.

As stated in SCIENCE for November 10th, the stone will be analyzed and studied microscopically, after which it will be in