searched for possible causes of their unhealthy condition. The trees in the best condition to examine were those on which the leaves were yet green, but from their general appearance indicated that they had been attacked by the characteristic trouble which was shown in a few yellow leaves at the tops. The roots of such trees were found in a perfectly healthy condition for some distance beneath the surface; the bark on the trunks from a distance of from five to fifteen feet from the base was green, full of sap, and apparently healthy; the leaves were almost free from insect attack and disease, in no case was there sufficient attack of this nature to indicate even a slight injury; the bark, however, at a point about two-thirds up from the base of the tree, was found in every case to be infested by *Dendroctonus frontalis* in sufficient numbers to kill all the bark for some distance above that point, and in this bark fully-developed beetles and pupæ were found on May 5, thus indicating that the eggs must have been deposited in the bark the previous summer or fall. All of the characteristic dead and dying Pine and Spruce trees examined showed abundant evidence that they had been invaded while yet green by this bark beetle.

It would seem that the turpentine escaping into the burrows made by the beetles in the green bark would render the conditions unfavorable for the progress of their work. They have, however, the power of removing it from their burrows, and they manipulate the sticky resinous substance with seemingly as much ease and in a like manner as the crawfish does the clay it piles up around its burrow. Often a half teaspoonful of the turpentine will be found massed about the entrance to the burrows made by the beetle. They push the turpentine out through a hole kept open in the pitchy, adhesive mass. I have observed them backing out from the entrance, shoving behind them a quantity of the turpentine, and at the same time they would be completely enveloped in it.

Trees invaded by these beetles the previous fall may remain green until spring when they are usually attacked by the large *Dendroctonus terebrans*, *Hylurgops glabratus*, and *Tomicus calligraphus*, the two former at the base of the tree, the latter in the green bark above. They are in turn followed by numerous other species of bark and timber beetles until the invaded trees may be, as I have found, the hosts of at least twenty-five species of scolytids coming like reinforcements to the aid of *D. frontalis* to make doubly sure the death of the invaded trees. Later on, these scolytids are followed by insects belonging to other families until a dead or dying tree may be the host of hundreds of species and millions of examples, breeding in and feeding upon every part of the tree from the base to the terminal twigs, rendering it worthless for lumber within a year after it dies.

Thus it will be seen that *Dendroctonus frontalis* may be the primary cause of not only the death of the trees but of their rapid decay.

West Va. Agricultural Experiment Station, Morgantown, West Va., July 20.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Auroral Display.

ON Saturday evening, July 16, there was visible, from this locality, in the northern heavens, the most brilliant auroral display which I have witnessed since the year 1859. Besides the usual exhibition of streamers of various hues, dancing along the northern arch like great hanging curtains, there was one most unique feature which I never saw or heard of before. A little after 10 o'clock, when the great brilliance of red and pink streams seemed to be dying out, and the northern heavens assuming a pale uniform hue, there appeared directly overhead a well-defined, nebulous arch, spanning the entire vault of heaven from east to west. At first a companion suggested that it was the Milky Way; but a few seconds' observation detected the Milky Way, running nearly at right angles with the arch — the two resembling each other somewhat in width and general appearance, except that the arch was more clearly defined and uniform in shape and outline than the other. In about fifteen minutes it began to fade away and disappear, the eastern portion disappearing first. In a short time there was only a bright strip near the western horizon, which much resembled the tail of a comet; but it, too, soon disappeared, and there were then no traces of the arch to be seen.

However, in a few minutes it began to reappear, and soon shone out bright and clear as before, — the arch being five to six degrees in width, — the eastern extremity at the horizon being a little south of east, and the other extremity being a little north of west, as if the whole had been drawn by a radius of a circle whose centre was a little east of the north pole. In ten or fifteen minutes this arch also disappeared as before.

Between the arch and the upper extremities of the gay streamers in the north there were several degrees of space lighted up by stars, and without any apparent connection between them. The band or arch seemed wider at the zenith than on either horizon — probably the effect of the greater distance of the horizon points from the position of the observer. The night air was quite cool, and I retired before midnight; and I have not learned whether or not the arch again reappeared.

T. A. BEREMAN.

Mount Pleasant, Ia., July 20.

Magnetic Storm, Aurora, and Sun-Spots.

A MAGNETIC storm raged here from 10.30 A.M to 4.30 P.M., central time, on Saturday, July 16, 1892. An electro-magnetic wave reached the general telegraph office of the C. B. & Q. R. R. at 10.30 A.M., making it difficult to operate, especially with the quadruplex. The duration of the electric disturbance was six hours; but the impulses came with varying intensity. The energy always appeared as a wave, beat, or oscillation; and when fully developed in the wires, seemed to set up a counter electro-motive force in opposition to the batteries. The fact that electro-magnetic energy traverses space in the form of waves, coincides with the now classical experiments of Hertz, who projected these waves not only through space, but brick walls. Perhaps a law like this will be discovered — *All modes of energy alternate.*

It is doubtful if a constant pressure exists in nature. In some instances, telegrams have been sent by means of nature's electricity — without batteries. This is merely a prophecy of that time coming when men will appropriate electricity when they want it, as they do light and heat.

An aurora appeared at 9.40 P.M., and consisted of many pearl-colored columns, at times tinged with red, occupying more than 100° in azimuth, and all converging near Polaris.

At 9.45 an apparition unusual in auroral displays was seen. This was a streamer of nearly white light, that, starting in a sharp point almost on the horizon, in the north-west, shot with great velocity north of Arcturus, passed over Corona Borealis, which constellation it equalled in diameter, crossed Hercules and Cerberus, and, passing over Altair, descended almost to Mars in the south-east, terminating also in a fine point.

This majestic sword moved bodily 10° to the south, and, after shivering and pulsating throughout its length three times, vanished, after existing fourteen minutes. The whole aurora lasted forty minutes. On July 9, a large cluster of spots, with two smaller groups and one larger isolated spot, were seen on the sun. All the larger spots had bridges, and on the 12th and 13th the tongues across the large one began to curve, which curvature rapidly increased on the 14th and 15th. On the 16th, these jets were arranged nearly in a circle, or had assumed