volunteers in town and country districts, who would take daily readings with the Kata thermometer, according to directions accompanying each instrument, which we would supply. The time for taking an observation need not be more than five or six minutes. Full details of the Kata thermometer, its construction and use appear in Dr. Hill's Report of Ventilation recently published by the Local Government Board. If any of your readers are interested enough in the matter to take these readings we should be glad if they would communicate with us.

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December 7.

Forests and Floods.

IN the issue of July 16 *NATURE* published a letter on the above subject in which I showed that pulverised soil holds more of the rainfall than the same soil after it is consolidated by time and rainfall, and it was pointed out that trees by the growth of their roots prevented the consolidation of the soil, and so enabled forest lands to retain more of the rainfall than undisturbed ground.

In that letter it was mentioned water passed more quickly through consolidated soil than through the same soil after it is pulverised. I have recently had an opportunity of observing how this peculiarity of dry soil acts in its disposal of the rainfall. In this district we had a very dry autumn; there was only 0.43 of an inch of rainfall in the 37 days extending from September 18 to October 24. The soil in the part of the garden to be referred to is of a light and sandy nature, and became very dry, though the plants seemed to get enough moisture for their requirements. The soil at the surface and to a depth of at least one foot seemed to be very dry. Before the end of the drought there were some cold nights, and the surface began to look more moist; this would probably be caused by the condensation of the rising vapour in the cold surface soil. When the rain began on October 25 the surface was thus in a good condition for absorbing it, and as the rainfall was never at any time heavy, and was well distributed over the eight days, during which 1.5 inches fell, none of it would run off the surface, as even during very rapid rainfalls the water easily enters that light soil. A day or two after the rain had ceased I was putting in some bulbs in the border, and was much surprised to find that below a depth of a little more than 3 inches of damp soil all underneath was as dry as it was before the rain began; while I find from tests made with soil lifted from the border, dried and broken up, that 1.5 inches of water wetted it to a depth of 6 inches. It was shown in the previous letter that pulverised soil holds a good deal more water than thoroughly wetted consolidated soil, so that the border was only moistened by the rainfall to one half the depth it would have been if all the rainfall had been retained by the upper layer of soil. The water evidently had not gone uniformly through the soil, but had made drainage tubes at certain places through which it had passed underground, leaving parts of the soil dry. This we might expect to happen if the soil was not easily wetted, or there were certain parts where the soil was more prepared to take water than at others. Such parts we might suppose to be those up which the water vapour rose most freely, and would therefore be damper, or the water may have escaped down the outsides of the roots of the plants.

Now in well stirred soil there are none of these preferential routes for the escape of the water.

In illustration of these preferential routes one might point to the condition of the soil on vertical cuttings which one sometimes sees where roads are cut through banks, or on any deep cutting made in soil. It will be noticed that these cuttings have no vegetation on them, and that the soil gradually weathers away, leaving an overhanging turf. It will be noticed that the soil on the face of the bank under the turf remains dry, all the summer at least, however heavy the rainfall. The water evidently does not percolate straight to the soil underneath, but takes a preferential route, backwards from the turf, and downwards behind the dry soil. The dry soil seems to reject the water, which prefers to pass through the damp soil behind it. It was noticed at the end of November this year that these banks were still dry though 6.4 inches of rain had fallen since October 25.

Some soils seem to have very little affinity for water, and act very much in the same manner as most substances do towards mercury. For instance, when one watches the seashore on a calm sunny day while the tide is rising one often sees all kinds of dry particles which are much heavier than water floating on the surface; these particles may be sand or other earthy matter. Again, when walking over bare sandy soil one sometimes sees a curious illustration of this objection of dry sand to being wetted. If the weather has previously been very drying and there comes a shower of rain, some of the little hollows in the sand will get full of water, and retaining it as well as if they were made of puddle clay. Of course these cups are very shallow, otherwise the hydrostatic pressure would be sufficient to break the water film between the grains of sand.

However, repulsion of the water by ordinary soils does not seem to explain the passage of the rainfall through the soil without wetting it equally. A small clod of soil from the border referred to was dried, after which it was placed in a shallow vessel in which was less than 1 mm. of water. The clod quickly absorbed the water, raising it to its top surface, which was fully 1 cm. above the level of the water.

It is difficult to explain this preference of the water for certain parts of the soil, where the soil wets so easily on contact with it. Is it possible that the water by sinking a little deeper at certain places comes to exert a kind of negative hydrostatic pressure, and so draw the water from the surrounding area? This, if once started, would have a gradually increasing influence owing to the increasing "head."

The border referred to was opened up at a number of places on November 23, after nearly 4 inches of rain had fallen, and even then there were parts of the soil quite dry a few inches below the surface. It is evident that something is still required to explain these preferential routes of the water in dry consolidated soil. There are none of them in pulverised soil, and this points to the probable advantage in "dry farming" of stirring the soil to a sufficient depth to retain the whole of the rainfall, in addition to the usual practice of stirring the surface soil after rainfall to form a mulch to check its loss by evaporation.

JOHN AITKEN.

Ardenlea, Falkirk, December 5.

On an Apparently Distinctive Character of the Genus *Bufo*.

ON p. 38 of Mr. G. A. Boulenger's valuable work on the "Tailless Batrachia of Europe" it is stated of the vertebral column of the Anura that "In those forms in which the vertebræ are procelous the eighth