

Kempe in the *Cambridge Messenger of Mathematics*, 1875 and 1876; and for a more general mathematical treatment of the subject to "Sur les Systemes de Tiges Articulees", par M. V. Liguine, in the *Nouvelles Annales*, December, 1875. There are other sources of information.

Some months after this paper was prepared, the author's attention was called to an American publication on this subject entitled, "Linkages: The Different Forms and Uses of Articulated Links", by J. D. C. DeRoos. This book (one of Van Nostrand's Science Series) was translated from *Revue Universelle des Mines*, and published in 1879. It can be obtained from the Van Nostrand Co.

NATURAL MEADOWS OF THE CUMBERLAND PLATEAU

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Some interesting phenomena of the Cumberland Plateau of Tennessee are the so-called "Natural Meadows". This term is applied by the inhabitants to tracts of land of varying areas that were free from tree growths when the white man came to Tennessee over a hundred years ago. A medium coarse wild grass grows on them and this has been a meadow for the section since its settlement.

These "natural meadows" are dotted around irregularly over the Cumberland Plateau. They vary in size from less than an acre to several acres. I know of one near Crossville, Tennessee, that must contain in the neighborhood of fifty acres. However, the latter is much larger than an average "meadow."

They are level as the prairie and practically free from tree growth. Along the branches that always flow out of them may grow some small water maples, some alders and possibly an occasional small tree or bush. These trees and brush interfered with the meadow practically none. The land was cleared when the country was settled and it stays cleared.

A sod of the sedgegrass, previously referred to, covers the ground, and with the exception of moss that grows freely down among the sedge plants, this is about all that grows in the "meadow" out away from the branch. The trees of the forest stop at the dead line for them, as though held back by magic. A few shrubs extend just a little beyond the trees and there the sedge begins.

The soil of the "natural meadow" is dark, being full of vegetable matter. Trees and parts of trees may occasionally be found buried in it. The depth varies from a foot or less to several feet. Probably three or four feet is a more common depth, while I have seen it exposed to a depth of six feet, where the branch had cut down. The soil is rather springy, and while a horse may be ridden over it in safety it would probably be unsafe to ride very fast in many places, especially in wet weather.

Evidently, trees and shrubs, as well as most herbaceous plants, do not grow in the "natural meadows," because soil conditions do not suit them. The forest around has stood there for centuries, probably, and scattered its seed over these open spaces and they have germinated but to find an unfavorable home and perish. The same has been true of the weed seed that have come from the woods and that have been carried there by birds and animals. Only the sedge-grass, the moss, and a few hardy trees and shrubs along the branches can survive the unfavorable conditions.

The soil is rather wet and very acid or sour. Surplus water gets out of it very slowly and this, with the great abundance of vegetable matter, causes the formation of a great deal of acid that is very harmful to most plants.

Many kinds of cultivated plants have been attempted on it but with very little success except where the soil was treated. Strange as it may seem, the soy bean has been found to thrive best. However, by using two tons of ground limestone or a ton of burnt lime per acre, Mr. J. E. Converse of the Tennessee Experiment Station, was able to grow fine crops of soy beans, millet, corn, and most other crops that he tried. By the use of lime he grew eleven tons of corn silage per acre, or about the equivalent of fifty-five bushels of corn. Drainage and lime are the main things needed to make a good farm soil out of the "natural meadows", although the soil is weak in phosphate and some potash would likely pay on potatoes and hay crops.

As to the probable origin of the "natural meadows" I do not claim to have built up any very strong scientific theory. Of one thing, however, all can be certain. Water played an important part. The vegetable matter has accumulated to a depth of three or four feet or more in the "meadows", while over the rest of the Plateau it is only from one to a few inches in depth. Water has kept the forest fires and the air from destroying the leaves and branches and trunks of fallen trees. These have been allowed to slowly undergo decay and, with the sand washed in, to make soil.

Evidence indicates that the "natural meadows" were once lakes or ponds. They are in basins out of which branches flow. The land slopes to them in every place except where the branch has its outlet.

We can imagine, then, small lakes into which leaves and twigs from the surrounding forest fell and washed, and, along with these, sand. The process gradually tended to fill the lake, while the flow

of the stream out of it slowly drained it. This process kept up until finally the lake was converted into a swamp and then into the "natural meadows" of the present day. If this theory is correct a few more generations or centuries might be expected to complete the drainage to such an extent that the forest would gradually creep in upon the "meadows."

Whatever may be the exact origin of the "natural meadows," they are a very interesting natural curiosity of the many of our State.