

Preliminary Factors in the Use of Tree Rings to Date Mounds of the Mississippi Valley

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The talkative tree rings have revealed knowledge to science that was supposed to have perished long centuries ago. By the use of the annual weather records so reliably kept by the trees, man has pushed the historical horizon of the Southwest back nearly eight centuries before Columbus discovered America, a time comparable in European history to the reign of Charlemagne.

This enlargement of our historical concept was accomplished by Dr. A. E. Douglass¹ of the University of Arizona. Dr. Douglass, who is an accomplished astronomer, originally began a study of tree rings in an effort to see if sun-spot periodicity had any effect upon the climatic conditions of our earth, which in turn would supposedly have an effect upon the yearly growth of the trees. This work progressed most satisfactorily and he soon became convinced that sun-spot periods could be traced out in the tree rings. To get large series of tree rings he began using ancient timbers from the pueblo ruins of the Southwest and from there it was only a step to the application of his tree ring calendar to archaeology. Through the use of this calendar nearly every ruin of importance in the West has since been dated.

Ever since this monumental work by Douglas appeared, the thought of applying a tree-ring chronology to the dating of the Mississippi Valley mounds has intrigued archaeologists.

Because the climate of the Mississippi Valley differs so widely from that of the West, it is absolutely imperative that we find out the exact influence which this climate has on tree growth. That is, has the amount of growth for each year been dependent enough on one specific factor, for example, precipitation, that it will be characteristic for the trees of that one region? If such a condition does not exist, then it will be impossible to set up a tree-ring chronology.

As yet no work has been published on this subject for the Illinois region. However, in 1935, Diller² published some positive data and conclusions concerning the correlation of tree ring width to temperature and precipitation for a series of beech-maple woodlands in northern Indiana. Some work by Lyons³ in 1935 for the New England area, shows that a similar conclusion may be drawn from that region.

With a desire to help in this regional study of factors controlling tree growth, I have done some work in central Illinois which I believe may be used in interpreting the general conditions existing throughout this portion of the Mississippi Valley.

In my work, sections were taken of three elm stumps from north of Normal, Illinois. The trees were selected with careful consideration

being given to all ecological factors which might interfere with the records kept by the trees. There are a number of such factors which may influence the amount of a tree's annual growth so that the dendrologist must constantly be on the alert for errors in his data.

For the sections from each stump, the width of each of the yearly growth rings was measured and recorded. The widths of all of the rings for each tree were then averaged; and to put each tree on a common basis with the others, the percentage deviation from the average was calculated for each ring. The next step was that of averaging the three percentage deviations for each year represented, and then plotting these averages on coordinate paper. To correlate this record with precipitation, it was necessary to secure a set of official rainfall measurements from the nearest weather bureau station which happened to be the Peoria station about sixty miles away. The rainfall yearly totals for each of the years represented by tree-ring records were then reduced to percentage deviations from the normal and plotted beside the tree-ring line on coordinate paper.

The conclusions drawn from this study are: that the two lines, one representing rainfall and the other tree-ring growth, correlate very definitely in the positions of their extreme highs and lows. That is, an extremely heavy yearly rainfall is coexistent with a noticeable increase in tree growth and vice versa. Moreover, the work of Diller was corroborated by the observation that, in general, drought years had their greatest effect upon the tree growth for the succeeding year; while extremely wet years affected the tree-ring growth of the same year.

These data very definitely show that tree-ring growth is due to some common factor which will make possible the recognition of a specific year through a series of trees over a comparatively wide area. In turn this fact makes it possible to set up a tree-ring chronology through which a mound may be dated by the fragments of wood or charcoal found there.

Recently the University of Chicago under the direction of Dr. Fay-Cooper Cole has begun such a task in the Mississippi Valley. Practically all of the research is being carried on in the region covered by the Tennessee Valley Authority. A letter from Dr. Cole states that a great deal of material has been assembled and is being worked up. However, none of this has been released up to date because Dr. Douglass, who has charge of the releasing of all such material, feels that the series for this region were not sufficiently long to justify a statement. However, we may look forward to some very interesting developments in the near future. It will certainly be a mile-stone in American archaeology when the dates are known for some of our Mississippi Valley mounds.

¹ DOUGLAS, A. E.—Tree Growth and Climatic Cycles: *Sci. Mo.*, Dec. 1933, pp. 481-495.

² DILLER, OLIVER D.—The Relation of Temperature and Precipitation to the Growth of Beech in Northern Indiana: *Ecology*, Vol. 16, Jan. 1935, pp. 72-81.

³ LYONS, C. J.—Tree Rings in New England: *Science*, Vol. 81, No. 2101, pp. 340-341.