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ESTIMATED TREE-RING CHRONOLOGY: 150-300 A. D.

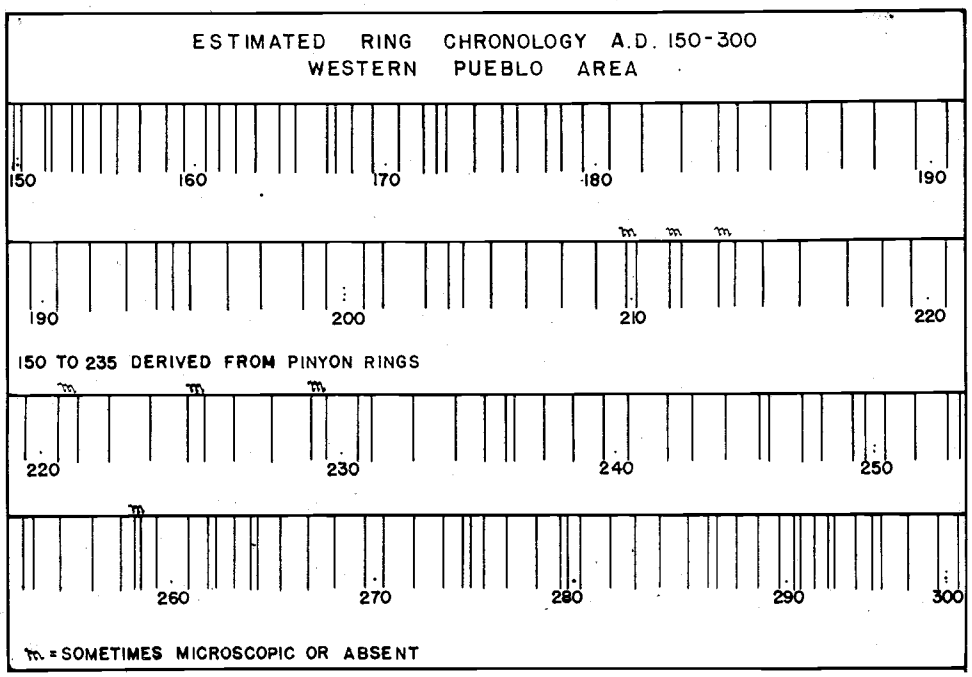
A. E. DOUGLASS

The very early chronology in the southwestern region has been developed from beams found largely in the northeast corner of Arizona.[1] This long chronology, partly shown here, has been called CPC, Central Pueblo Chronology, to distinguish it from a chronology in the vicinity of Flagstaff which extends back into the late 500's, developed in cooperation with Mr. John C. McGregor of the Museum of Northern Arizona, and another long Rio Grande chronology extending to the 1100's and before, developed by Mr. W. S. Stallings of the Laboratory of Anthropology in Santa Fe.

The Central Pueblo Chronology at the present time depends largely upon the specimens collected by Mr. Earl H. Morris at Mummy Cave, south of the Lukachukai Mountains and in various caves in the Red Rock Valley between the Lukachukai and the Carrizo Mountains to the north. This means an extended area covering about 40 miles in a north-south direction. The first specimen in this early chronology was BE-33, secured in 1923 at Mummy Cave. Its importance was recognized in 1927 and its ring sequence began the EPD floating chronology, and determined the zero year of that chronology from the center of that specimen, which proved to be the year 402 A. D. Earlier EPD specimens were largely obtained in the form of charcoal from Mummy Cave, and the best, M-105, 106 and 110, gave superb records through the 300's. Two pronounced drouths in the 300's, namely, from 320-327 and 340-344, produced for a time uncertainties in the counting, but a large number of duplicates

[1] Mr. I. F. Flora of Durango has secured early specimens in Colorado a little to the northeast of this area.

RING CHARACTERS, 150 TO 300 A. D.



Pinyon Series

A.D.	
152	small
154	very small
156	smaliish
158	locally absent in places
167	very small
168	smallish
172	small
173	very small
178-181	increasing size
184	smallish
194-5	small
199-201	small
204	small
210	very small, locally absent
212	very small, locally absent
214	very small, locally absent
221	very small, locally absent
225	very small, locally absent
229	very small, locally absent
231	small

Douglas Fir Series

A.D.	
236	very small
245	very small
253	small
258	very small
262	small
265	very small
270	small
274	small to very small
279	very small to microscopic
286	small to very small
290-294	very small
291 and 294	very small to microscopic
297	very small
302	microscopic, sometimes absent

carried a successful enumeration of the rings through those difficult periods.

The 200's from 235 to 300 have become very well known through a considerable number of Douglas firs of the very highest order of excellence in climatic characters. Hence during that part of the present interval the estimated ring size is well established. Regarding the time between 150 A. D. and 235, we have five specimens that cover important parts of the interval. The longest record is in MLK-152, which, however, has some defects of the nature of lightning scars producing certain eccentricities in the rings at some parts at this general time; otherwise it

tends toward complacency with a few well-marked deficient rings that serve well from cross-dating. Number M-143 is also a Douglas fir extending from 90 to 358 A. D. and relatively free from injuries, and yet it has several narrow zones of reinforced rings that probably mean some special strain or injury in another part of the tree. Three pinyons, however, give us more detailed information regarding this interval, M-159, MLK-110, and MLK-153. M-159 is a core one inch in diameter, and therefore gives only a small part of the original circuit of the tree. Its record extends to a little before the year 200, but some disturbances in the rings, probably omissions, make its inner parts rather uncertain as a guide. MLK-153, however, gives an excellent record all through the 200's, and back to 150 A. D. (see cut), and while its rings become microscopic in ring size near the center, it has been possible to compare opposite radials of the tree and find a very satisfactory correspondence upon which considerable reliance can be placed. This dependability has been verified by MLK-110, a pinyon which has a reliable record after 235, giving a good account of features we know are there. It gives in addition an excellent record back to 199 A. D., judged by its agreement with MLK-153. The rings are smaller and A. D. 210, 214, 221, 225 and 229, which are small in MLK-153, are locally absent; 210 is taken as absent.

There are differences between pinyons and Douglas firs in their manner of record, but in following the pinyon we are probably getting much nearer the actual climatic sequence than if we limited ourselves to the two more complacent firs, and we have the advantage of the fairly complete circuits of the sections. In order to place these early rings on record a half-tone photograph is presented, made through a Zeiss epi-condenser with side illumination on a 45° cut across the grain.

AN EFFECT OF STARVATION ON PINE TREES

L. F. BRADY

The material on which this paper is based was observed and collected in the course of an unfinished investigation of the effect of plant growth in the disintegration of the dacite boulders at the foot of Elden Mountain near Flagstaff, Arizona.

Five dwarfed pine trees (Pinus ponderosa) were found growing in small holes in these boulders, (see cut) and all of them proved, as was expected, to be unusually old for their size; although, owing to the probability of the presence of double or even multiple rings, it is not possible to give their actual age until further microscopic examination of their rings has been completed.

The rock on, or in, which the trees in question grew is a hypersthene-soda dacite, and its surface is characterized by cavities, often with overhanging edges, ranging in capacity from a few hundred cubic centimeters upward, and in depth up to 50 cm. These cavities, only the smaller of which contain much soil and vegetation, appear to be due to the weathering of portions of softer, "drusy" layers in the rock, which may represent old flow surfaces. The soil in the cavities consists largely of unaltered fragments of the rock with about 60% of rock-dust and humus—the former resembling closely that found under the lichens which cover much of the surface of the boulders and being probably due to their action.

As the growing level of the trees was in every case 50 cm. or more above the ground, there is very little probability of any water being available to the roots by capillarity from below through so massive a rock as dacite. As a result the trees were dependent for moisture on the rain