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Single Copy, 50c

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The Tree-Ring Bulletin will publish papers resulting from original research in tree-rings in relation to climatology, archaeology, and other fields. For reports of projects in tree-ring dating, a tabular form as in Vol. 6, No. 1 is suggested. Until funds are available authors will be requested to pay the cost of illustrations. Each contributor will be given twenty-five copies of the Bulletin in which his article appears.

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**CHECKING THE DATE OF BLUFF RUIN, FORESTDALE****A STUDY IN TECHNIQUE**

By A. E. DOUGLASS

In April, 1942, Mr. Ralph Patton, graduate student in the Department of Anthropology, University of Arizona, and member of the class in Dendrochronology, secured a date at about A.D. 310 on some twenty specimens from the Bluff Ruin at Forestdale, near Showlow, Arizona. He had assisted in the excavation of the specimens and was assigned to the study of that collection as research work in the Laboratory of Tree-Ring Research. Soon after getting this result, he was obliged to leave for Alaska to be gone six months. At the end of that time his work in Alaska was extended. Dr. Emil W. Haury, as Head of the Department and Director of the excavations at Forestdale (sponsored jointly by the Arizona State Museum and the American Philosophical Society) was anxious to have a more complete report on the age of Bluff Ruin because it showed signs of being very early. It might supply important information in the prehistory of the Southwest, since there were only four known sites whose ring records were giving any real information about the 200's or earlier. Accordingly, on his request and after some delay, the writer began what was expected to be a brief review of Bluff Ruin specimens. But due to novel conditions encountered, it has extended into a number of weeks.

**LOCATION**

Bluff Ruin is located on the top of a bluff-faced hill at the south edge of a shallow valley and about 1.5 miles southwest of the previous Forestdale excavations.<sup>1</sup> Its elevation about sealevel is about 6600 feet. The ruin is surrounded by ponderosa pines and common pinyons and is about 150 feet above the flat valley floor, which is perhaps a half-mile wide. The inter-

<sup>1</sup>Haury, Emil W., New Tree-Ring Dates from the Forestdale Valley, East-central Arizona, Tree-Ring Bulletin, Vol. 7, No. 2, pp. 14-16, 1940. Note: the details here given are essential to an interpretation of the trees' reaction to their climate.

mittent stream along the valley has cut a bed about ten feet deep. Boring tests in living trees made by Mr. Edmund Schulman show that the pines produce large complacent rings on the valley floor, and rise into good sensitivity, though with many doubles, upon the steep slopes.

The previous excavations in this vicinity, chiefly in 1939-40 on the valley floor at Little Bear Camp, had revealed some 50 charcoal specimens which were dated without difficulty in the early 700's with rings largely running through the 600's,<sup>2</sup> and these rings were of the sort found in the living trees, rather large, with frequent easily recognized doubles and microscopic or locally absent small rings in the years that commonly showed those characters in the well known Pueblo chronology. There were some slight modifications of a few details.

We recognized long ago that much older ring records would be fewer in number from any one ruin, and dating would be more difficult, and each area might have special problems. Of this, the 1941 collection from Bluff Ruin has turned out to be an illustration. Since other sites will be found that present even more difficult problems, it seems worth while to place on record those encountered here and the procedures used in meeting them.

#### THE COLLECTION

About 175 numbered specimens were collected in 1941 from Bluff Ruin. Every individual piece had a separate number. In some cases, quite a number must have come from one tree; and that suggested the first point in technique in these early sites. In establishing a date, it is almost essential to have ring records from two or more trees. Hence, it is important to know how many different trees are represented in the dating specimens. So, it would help the dendrochronologist greatly if, as far as possible, the fragments of one log are grouped under one number at the time of collection.

In the work Mr. Patton had time to do, he listed the full set of specimens received at our laboratory, grouped them as to source, and picked out a couple of dozen that looked datable, made readings and skeleton plots, and derived the outside date of about 310 A.D. as stated above.

#### DATE CHECKING

*Sequence A.* The specimens which Mr. Patton had dated, about twenty in number, were carefully reviewed; all pinyon charcoal, with ring records usually 40 or 50 rings in length and ring widths of one or two millimeters. When combined, they gave a typical pueblo chronology from about 235 A.D. to near 310 A.D., the exact identity at the end being slightly uncertain because no very small 302 ring had been found. But soon one or two of Patton's group were found to show 302 as a microscopic ring only present locally. Then other specimens not on Patton's dated list, such as FST-279 and 282, were found to give 302 as a perfectly evident but small ring. He would have found these easily if he had had more time in this study. Thus in this pinyon charcoal there were important verification features that came out on the second careful review, and Patton's dating was sustained. The ring record so worked out was called "Sequence A." It will be noticed that we designate a ring by its date.

But the situation was unsatisfactory because all of these dates came apparently from one single pinyon tree. If these were the only datable speci-

<sup>2</sup>*Op. cit.*; and Douglass, A. E., Age of Forestdale Ruin Excavated in 1939, *Tree-Ring Bull.*, Vol. 8, No. 1, pp. 7-8, 1941.

mens from the site, the result, though strong, might have to be held for verification. But there were 150 other numbered pieces.

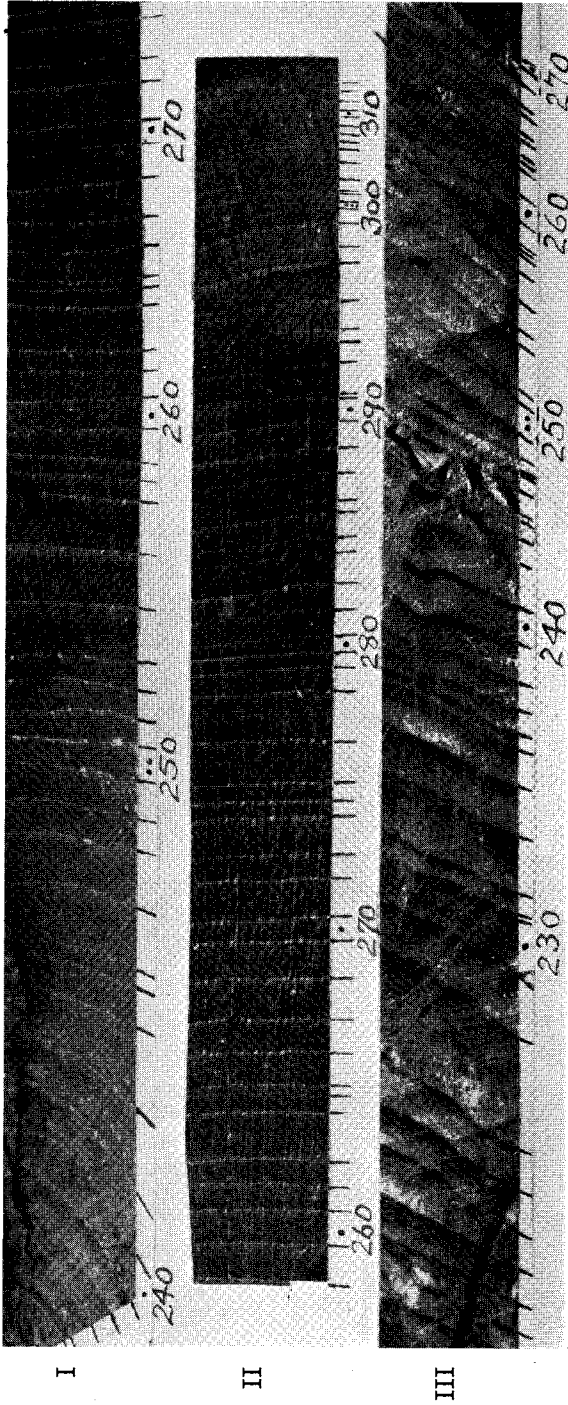
*Sequence B.* Among the specimens, all charcoal, set aside by Patton, were two numbered B-21, and one numbered B-14, with 100 or more crowded rings that showed no apparent resemblance to Sequence A, but which cross-dated together strongly, especially in the early half. This sequence was called Sequence B. Later, other numbered specimens were found belonging to this series until about ten were unmistakable. All members of this sequence group were obviously so much alike that they could be regarded as from one tree, a pine about 120 years of age, about four inches diameter and with outer parts full of crowded rings. Very careful sketches and readings were made and skeleton-plotted and compared with the standard skeleton plot of the Pueblo area in all possible dates from 130 A.D. to beyond 750 without result.

So increased care was taken in reviewing the remaining specimens. Two-thirds of them were either (a) erratic pinyon, unreadable, (b) compressed pinyon, also unreadable, (c) juniper, possibly *scopulorum*, with satisfactory ring series for confirming a chronology, but poor aids in building one; this inadequacy is due to complacent series and occasional confusing doubles that so far have not been distinguishable as such; (d) besides these were some fragments of readable ring records too short to be of service.

*Sequence C.* Two other sequences appeared; one, "C," was a supersensitive pine of which there were three servicable fragments. Of these, the best was FST-199 with some 50 rings; its largest ring was some 4 mm. thick and yet here and there were one, two, or three rings of about 0.1 mm. thickness. This sequence was sketched and skeleton-plotted and compared with the known Pueblo chronology over the same centuries from A.D. 130 to the late 700's. The difficulty rested, of course, in possible uncertainty in the microscopic rings. After long study, it was located at A.D. 242 to 290, with 279 slightly uncertain. Two other specimens, FST-245 and 257, had the same ring type and other similarities and fitted fairly well into the last 30 rings of the satisfactory number 199. These three could have come from one tree. Later on, another specimen in this group was found, FST-202, which gave a sensitive sequence from 231 to 285.

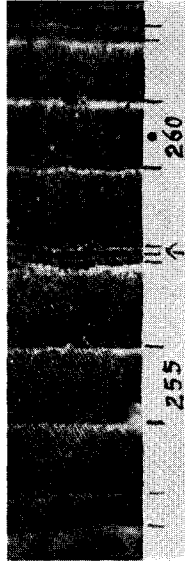
*Sequence D; FST-163.* Four specimens, FST-163, 200, 289 and 144, not crossdated, were grouped in Sequence D. The last two, numbers 289 and 144, were short and not readily solved; so they are not discussed here because they are not vital to this dating. Numbers FST-163 and 200 had been preserved through the centuries in part because they were tough pine knows.

In the vicinity of knots, rings grow in different directions and also at different rates. The identification of the sequences might depend on one or both of its extreme parts and the location of these is not known. So it seemed urgent as a policy to lay bare the outside very gently, beginning in places not likely to contain the end rings but near enough to get their time-direction and begin the construction of an individual chronology of the specimen. FST-163, 10 inches long and at first named the "Stick," was the most promising. Practically every square centimeter was shaved and the sequence was read and sketched. Special difficulty came when very thin ring layers advanced toward an unrelated outside angle of the wood. Important cases like that remained until a very sharp razor blade was available. The plot of this record was compared with the known Pueblo area plot without success.



BLUFF RUIN RING SEQUENCES

Parts I and II, pinyon ring record, dated by Patton; Part III checking record in sensitive pine, FST-200. Enlarged X 3.5. See text.



Part IV. "Predicted" rings A.D. 257 and 258 (at the arrow) in specimen FST-200. Enlarged X 12.

After failing to date specimens from the master plot, the next step was to see if they resembled each other in such a way as to correct each other's omissions. This was done by skeleton plots.

*FST-200—201.* The one remaining workable piece was a small pine section, FST-200. It had different ring curvature and type, and different wood density and color from the other pieces in hand and therefore probably came from a different tree, which made it valuable. As the reading of these various ring sequences progressed, and many specimens were examined for the third or fourth time, number 201 was found to resemble number 200; then it apparently was identical; later still, it was found actually to fit the other, showing that they were parts of an original single piece.

#### VERIFIED PREDICTION

"Then number 200, with excellent sensitivity, was found to resemble closely number 199 in the C group, which had been dated. Thus the common interval was about A.D. 240 to 275. Number 199 extends to about A.D. 285; number 257, on microscopic examination proved to show rings out through 306. . . . Since number 199, a fine series, showed 257-8 as exceedingly small, the assumption of their absence in number 200 would bring an almost perfect sequence in that specimen."

The preceding words under quotation were written for an early draft of this paper, during the first examination of numbers 200 and 201. Two weeks later, a new surface was cut on an untouched part of FST-200, and there were the rings 257-8, as anticipated. That is what we mean by a "verified prediction." A photograph of these rings is shown in the illustration. This "verified prediction" experience completely settled the matter of date of Bluff Ruin in the mind of the writer. It is the acid test of crossdating and has happened hundreds of times in the experience of most of us.

*Provisional Dates.* A ring pattern in the 240's showing in FST-199 and 200 led to the provisional dating of the inner part of Sequence B placing it near A.D. 212, where there is a short pattern that resembles distinctive features in MLK-153 and 110. This will be discussed at a future time. This would bring the outside of Sequence B near 320 and probably FST-163 near the same time.

#### PHOTOGRAPHIC RING RECORDS

The accompanying illustration shows early sequences in trees from the Bluff Ruin at Forestdale. Excellence of photograph has been sacrificed a little to the preservation of specimens. In this way, the small pieces of charcoal and wood do not have to be altered in a fashion that might sometime prevent further investigation of the ring structures if thought desirable in climatic studies. The first and second strips carry the typical pinyon sequence dated by Mr. Patton. Three specimens are used; the earlier one 234 to 253 was designated by him as B-3; the central specimen from 253 to 295 was B-8; and the outer part from 295 to 316 came from specimen FST-279. B-3 and FST-279 are enlarged X 3; B-8 is enlarged X 6. The rings are quite readable from 234 to 310 or later. The outer edge of each ring is marked by a line below; a very small ring present in the specimen is marked by two close parallel lines, as at 302. A missing ring is marked by an inverted V as in the third strip, at 229. This third photograph was taken from specimen FST-200. The two predicted rings at 257 and 258, which give great strength to the dating are shown in the fourth strip. Enlarged X 12.

There is a weak spot at 243 in the "double" which, in the short space it is visible, seems to have a sharp outer edge. Considering the action of modern trees in that locality, this is the best interpretation until confirmation or correction is secured. It does not affect the dating of the ruin.

#### THE DATING CHECKED

The dating of Bluff Ruin secured by Mr. Patton is considered checked and sustained. The sequences supporting this dating are therefore (1) sequence A, 234 to 320±, pinyon, 20 or more specimens, one verified prediction, at 302; (2) sequence C, 231-306, highly sensitive pine, specimen numbers FST-199, 202, 245, and 257, verified predictions at 291, 297, and 302; and (3) Sequence D, 224 to 275, very sensitive pine section, specimens FST-200 and 201 with very strong verified prediction at 257 and 258.

There are four sites from which dated ring records in the 200's have been obtained, namely, Mummy Cave and Red Rock Valley in northeastern Arizona, Durango in southwestern Colorado, and Kanab in southern Utah. Forestdale is added as fifth in that list with a construction date not far from A.D. 330±10.

#### SOME IMPLICATIONS OF THE BLUFF RUIN DATES

EMIL W. HAURY

Dr. Douglass' preceding article on the analysis of tree-ring material from the Bluff Ruin (Arizona P:16:20, Arizona State Museum Survey) in the Forestdale Valley, east-central Arizona, is an extremely important addition to our growing southwestern archaeological picture. So that the full significance of this work will not be lost, the following archaeological notes are appended.

The cultural remains of this village so far unearthed include eight pit-houses of round or roundish form (average diameter about 3.5 meters) but otherwise quite featureless, scooped out of the solid sandstone bedrock; there was one large (over 10 meters in diameter) round structure which must probably be classed as religious rather than domestic. All cultural material was exceedingly scarce. Stone implements include both basin and crudely troughed metates. Manos are large, generally of oval form. Present also are small stone vessels or mortars, tubular stone pipes, and a small amount of chipped scrapers, knives, and straight-based leaf-shaped projectile points. Bone implements were almost entirely lacking and pottery was present but in small quantities. One extremely fragmentary burial suggested that inhumation was practised.

The chief pottery type was a smoothed plain brown ware, and there were small amounts of polished smudged and red types. There was no painted pottery. The pottery is manifestly in the Mogollon tradition and the relative unimportance of it in the culture suggests that the horizon was near the threshold of the introduction of ceramics.

Basketmaker or Anasazi sherds of any description were not found, although such are present in later phases.<sup>1</sup> Intrusive pottery assignable to

<sup>1</sup>Haury, E. W., *Excavations in the Forestdale Valley, East-Central Arizona*. Social Science Bulletin, No. 12, University of Arizona, pp. 84-85, 1940.