

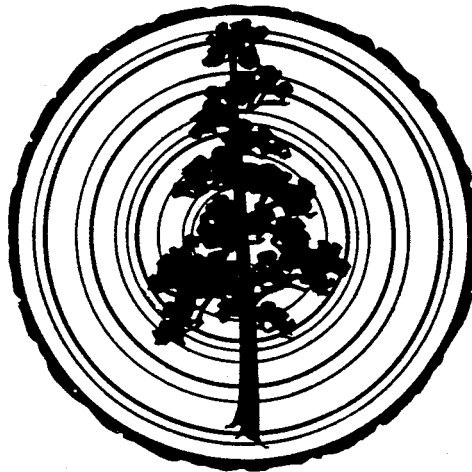
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Manuscripts should be typewritten in double spacing. The Editor reserves the privilege of returning to the author for revision approved manuscripts and illustrations which are not in the proper form for the printer.

In reporting tree-ring data authors are requested to submit their data in a table such as appears on the back page of this number. This will cut the cost of publication very greatly.

Until funds are available authors will be requested to pay the cost of illustration which may be line cuts or half-tones, but must be drawn or printed on white paper, and mounted with paste, not glue.

Each author will be given, free of charge, twenty-five copies of the *Bulletin* in which his article appears. Reprints may be procured at cost with or without covers if ordered at the time the galley proof is submitted.

Manuscripts and illustrations should be sent express prepaid or by registered mail to the Editor, Dr. A. E. Douglass, Tree Ring Laboratories, University of Arizona, Tucson, Arizona.

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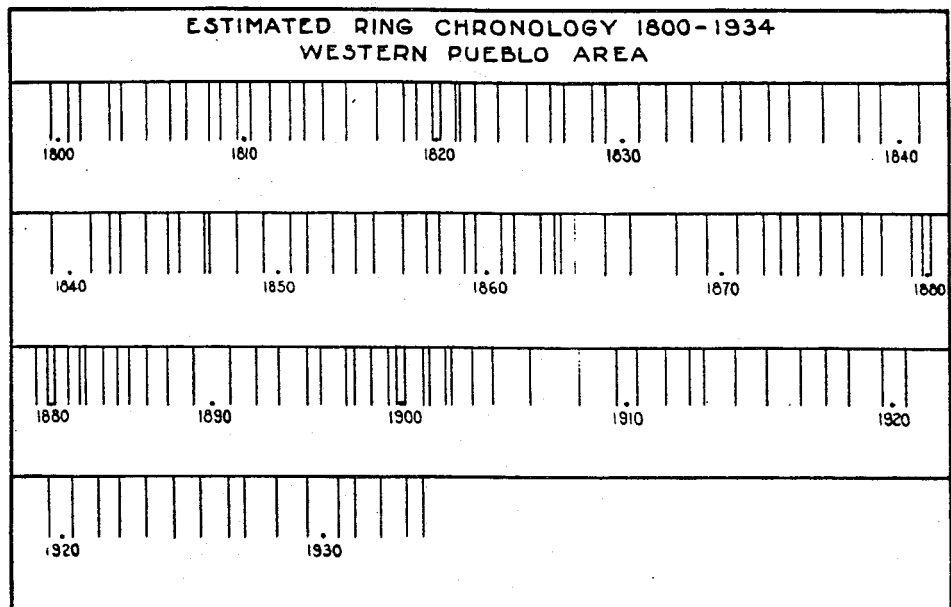
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ACCURACY IN DATING—II.
THE PRESENTATION OF EVIDENCE

BY A. E. DOUGLASS

Dating and chronology building depend on a series of comparisons between long sets of rings. The method first used, and kept up for many years by the writer, was a direct comparison between radial pieces of wood, usually "V-cuts" from the tops of stumps or the ends of logs. These were made very small and several could be held in the hand at once. Two could readily be compared by moving one slightly along the other, keeping corresponding rings in contact as the eye passed from ring to ring. Soon it was found that a general picture of the sequence stayed in the memory, and comparisons of the new specimen with this memorized sequence were easier and far more rapid. It is, in fact, the most rapid way of dating specimens if many individuals are involved. When all is said, direct comparison on wood is the most complete method and is the final test in every dating process.

All such comparisons constitute "cross-dating" and must be placed on record in some form. Measuring ring widths has of course been a



ESTIMATED RING CHRONOLOGY, 1800-1934

The accompanying plate gives estimated relative ring sizes since 1800 for the Western Pueblo Area. It is a compromise between forest border type and forest interior. In the former type the ring records are highly sensitive with sudden variation from large to small size or vice versa, while forest interior records have the sudden variations smoothed out to some degree. In this representation, rings of the smallest size shown are often microscopic or often absent in trees or parts of trees that have every small rings. No attempt has been made here to indicate rings likely to be double. In this ring series the placement of small rings of good dating character is probably fairly representative of the Pueblo area but the change or increment from year to year in a succession of larger rings is not to be taken as equally well estimated.

practice from the beginning of tree ring work, but plotted measures are not found to be very satisfactory aids in dating. Measures can rarely be made in the field, and its working substitute, the skeleton plot, came strongly into use in 1927 after a successful dating of a fine Douglas fir sequence from Mesa Verde. But the skeleton plot, though a great convenience, gives only deficient years, and leaves many rings undescribed. Mr. Gladwin's increment plot (which I hope he will describe and illustrate in these pages) records each ring on the basis of its change from the preceding ring. It is an important method of recording ring sequences, but cannot conveniently be done in the field since it involves complete measurement. Full measures and memory dating, aided by skeleton plots, have become habitual usage in our laboratories.

The presentation of dating evidence to other students, for criticism, improvement and use is of the first importance. When examining the work of others, I prefer to see the original specimens; they carry the whole story. Dating of them is checked by memory if they come from the western Pueblo area (west of the Rio Grande). If they are from other parts of the world, then many original specimens must be seen in order to develop a chronology. For this purpose skeleton plots are unconvincing. Plotted measures tell something about each ring, and usually indicate a strong identification of each, but ordinary plots are "cold" in any questionable case, and do not lead to a satisfactory decision.

Photographs of the originals are the ideal method of presenting specimens. They give the details and if the specimen has been well selected, the print becomes a superb reference sheet. Ring photography is difficult, and requires several special adaptations. A panchromatic plate and color filter are necessary when heartwood and sapwood are involved, in order to decrease the color contrast in these different parts. Surfaces cut with a razor blade are regarded as much superior to the best abraded surfaces, if any small rings are present. The best razor-cut surface can be made at an angle of forty-five degrees to the grain. On such surfaces there are two types of reflection and an exactly correct illumination becomes vital to successful photography. The razor-cut surface (prepared quickly by hand) has some unevennesses and hence a long focus lens is needed to give the best definition in enlargement. Our photographic prints enlarged three to ten times the original, have detail that must be viewed with a magnifying glass to appreciate.

When it comes to reproduction on the printed page, ring photographs are likely to lose some of their fine detail. A half-tone picture is made through a screen having about 125 lines to the inch in the final print. This does not bear any magnification with a hand lens. The average ring size in a long sequence photographed in 1929 is six to the inch of which a small percentage are minute or faint. In that series of 1200 rings, about a dozen, or one per cent, are difficult to find, or absent. Each such ring should probably be photographed on a larger scale to make it easily seen in the reproduction, and a print showing it exhibited with the main sequence.

The photography of tree rings is difficult and half tone plates are expensive, but the photograph must remain the real way to present evidence that is convincing to others. Some cooperative method suggests itself, both for the photography and for the publication. We may feel confident that this will be worked out.

There remains one relatively crude way of reporting a given series of rings, of which an illustration is made in connection with this article.

It is the "sketch" method which can be reproduced by the simpler zinc plate process, and which at times serves a real purpose of its own. It has long been a habit of the writer to make free-hand sketches of important sequences. These, of course, are not at all accurate, but are found to be very readable. After viewing thousands of specimens and studying different parts of the long chronology in scores and even hundreds of different specimens, a mental picture of the different parts of the Pueblo area chronologically has resulted. When this is put down on paper it becomes a generalized sketch whose value lies not in the precision of ring size, but in its dating qualities for the Western Pueblo Area. It represents for the last few centuries the mental impression left by a thousand or more trees. It has been suggested that such a series of generalized sketches, extended back to the earliest known Pueblo chronology would have some usefulness to students. In giving this plate of "Estimated Ring Chronology Since 1800," the writer desires to receive comment and to learn how far such reproduction may prove useful.

In closing this survey of the problem of presenting suitable evidence of dating accuracy, the writer is not yet assured that sketches such as here referred to, constitute acceptable evidence, yet their value is worth considering. In the present stage of tree ring work, a thorough examination of the best original specimens by one of the most experienced workers, recommended by the Tree Ring Conference, is considered the best form of securing reliability.

NEW DATES FROM MESA VERDE

HARRY T. GETTY

The dates presented in this report were obtained from beam material secured in the cliff dwellings of Mesa Verde National Park. This material was secured by the writer as an employee of the Department of the Interior, National Park Service, during the summers of 1932 and 1933.

Dates had previously been obtained for six of the major cliff dwellings from material secured by the National Geographic Society tree-ring expedition of 1923 (1)*. The material obtained in 1932 and 1933 yielded additional dates for the six ruins previously dated and new dates for five other major ruins. This additional information concerning the ruins of Mesa Verde National Park is being used in the Educational Program of the National Park Service (2).

The collecting of the beam specimens from these ruins was not accompanied by excavation nor by the collection of specimens of the associated material culture. However, all ten of the ruins included in this report fit into the Late Pueblo** culture complex as shown by the style of architecture, and by the results of excavations, either partial or complete, previously carried on in these ruins.

Surface ruins on the Mesa Verde yield only pinyon and juniper (chiefly *Juniperus utahensis*), indicating the cover of the mesa top. Cave ruins yield about equal amounts of pinyon and Douglas fir, with a larger proportion of juniper. For the cave structures, in addition to the pinyon and juniper of the mesa top, they were able to get Douglas fir growing near the caves on the slopes of the canyons. Only rarely does yellow pine occur in the ruins, indicating that then, as now, this tree grew only in the northern and higher parts of the Mesa Verde, remote from most of the ruins.

*Numbers refer to Bibliography. **Pueblo III.

Site	Piece Number	Outside Dated Ring	Inside Dated Ring	Approx. Radial Line in MM	Kind of Wood	Type of Specimen	Sap Heart Date	Rings Lost at Outside	Rings Absent Within Sequence	Estimated Bark Date
Cliff Palace	MV 40	1264	1237	25	DF	F.Sec.	1244	0	0	1264
Cliff Palace	48	1209	1091	62	DF	Core	1176	Few	0	1212 \pm 3
Cliff Palace	51	1266	1105	58	Pnn	Core	1234	Few	0	1269 \pm 3
Cliff Palace	52	1267	1222	63	DF	Core	1260	0	0	1267
Cliff Palace	53	1273	1159	50	Pnn	F.Sec.	1233	0	0	1273
Buzzard House	64	1273	1176	83	Pnn	F.Sec.	1240	0	0	1273
Jug House	65	1066	896	71	DF	$\frac{1}{2}$ Sec.	1009	0	0	1066
Jug House	66	1066	947	83	DF	Core	1009	0	2	1066
Ruin No. 16	74	1261	1210	40	Pnn	F.Sec.	1218	0	0	1261
Long House	84	1204	1139	35	DF	Fragm.	1184	Cons.	0	1244 \pm 20
Long House	88	1211	1132	91	DF	$\frac{1}{4}$ Sec.	1190	Cons.	0	1231 \pm 20
Hemenway H'se	148	1172	1056	36	DF	Fragm.	1130	Few	0	1177 \pm 5
Oak Tree House	182	1184	1114	34	DF	Core	1161	0	0	1184
Balcony House	192	1272	1220	49	DF	Core	1244	0	0	1272
Balcony House	196	1204	1175	36	DF	Core	1183	0	0	1204
Sq. Tower H'se	282	1246	1167	95	DF	Core	1223	Few	0	1251 \pm 5
Sq. Tower H'se	284	1243	1158	46	Pnn	Core	1198	Few	0	1248 \pm 5
Sq. Tower H'se	292	1241	1149	40	Pnn	Core	1200	Few	0	1246 \pm 5
Sq. Tower H'se	293	1242	1157	77	Pnn	Core	1193	Prob.0	0	1242

Fragm.—fragment, piece of split wood used in roof construction.

Where beam material was abundant preference in collecting specimens was given Douglas fir and pinyon over juniper, but where material was at all scarce everything was sampled. Beams in situ were given preference over fallen material, though both types were sampled and carefully noted as to position in the ruin. Information concerning the exact location of the beams yielding the dates included in this report are on file in the tree ring laboratories at the University of Arizona.

Dates have been obtained for another ruin in Mesa Verde National Park, Spruce Tree House, which are not included in this report. This ruin contains probably more beams than any other Mesa Verde ruin. Therefore, the writer took a series of specimens from all the beams that it was possible to reach, progressing systematically from one end to the other. It is hoped that the results of this study can be presented in another paper at a later date.

The dates presented here substantiate and emphasize a point previously made by Haury (3) that building activity in the Mesa Verde district came to an end just prior to the beginning of the great drought period of 1276-1299. The latest date given here is 1273, and one of the Spruce Tree House specimens gives a date of 1274. But the number of dates clustered in the middle of the 13th century and proceeding to a point just a couple of years short of the beginning of the drought is evidence of the fact that there had been no appreciable decline in activity on the Mesa Verde until the drought struck.

The sap-heart contacts on all of the pinyon specimens included in this report are very indistinct. The dates given in the accompanying table

for these contacts represent the best possible determination but should not be taken as absolutely certain.

In the Mesa Verde material the following rings are consistently small and can always be relied upon in dating:

1150	1166*	1182	1216	1240	1251**
51	68	86*	17*	44	52*
56	69	91	18	45	54**
58	75*	92	27**	46	58
61*	77	99	36	47	63

*usually microscopic

**locally absent

The writer takes this opportunity to thank Dr. A. E. Douglass for checking over the specimens included in this report and certifying the dates obtained.

- 1—Douglass, A. E., 1929. The Secret of the Southwest Solved by Talkative Tree Rings. National Geographic Magazine, Vol. LVI, No. 6, pp. 745-750. Washington, D. C., 1929.
- 2—(a) Franke, Paul R., 1933. New Dates for Mesa Verde Ruins. Mesa Verde Notes, Vol. IV, No. 1, pp. 19-20. Mesa Verde National Park, Colorado, July 1933.
(b) Annual Information Bulletin, Mesa Verde National Park, p. 24. United States Government Printing Office, Washington, D. C., 1934.
(c) Tree Ring Exhibit, Park Museum, Mesa Verde National Park, Colorado.
- 3—Haury, E. W., 1934. Climate and Human History. Tree Ring Bulletin, Vol. 1, No. 2, pp. 13-15. Flagstaff, 1934.

SPECIMENS FROM THE PUEBLO AREA COLLECTED BY THE FIRST BEAM EXPEDITION 1923

ALFRED PETERSON

In the seasons of 1923, 1928, and 1929, the National Geographic Society supported "Beam Expeditions" in the Pueblo area for the collection of datable wood material. Something over 430 specimens were secured. Tabulated lists of some thirty-five specimens each, giving information regarding the dated pieces, are being prepared for publication. The following table is the first of these and includes the dated specimens in the first one hundred, all collected by the First Beam Expedition in the season of 1923. The "BE" in the specimen number refers to "Beam Expedition." Mr. J. A. Jeancon of the State Museum, Denver, Colorado, carried on the work of collecting in association with Mr. O. G. Ricketson, Jr., of the Carnegie Institution. Mr. Jeancon's interesting report of his work, dated September 10, 1923, giving the history of each individual specimen collected, is on file and available for inspection at Dr. Douglass' Tree Ring Laboratory at the University of Arizona.

Of the 100 specimens about 10 per cent are juniper, and about 20 per cent are pinyon, while the remainder are Douglas fir or yellow pine, among which are most of the dated pieces. The pieces are in the form of full sections, part sections, v-cuts, cores, and a few fragments. The greater part of these are solid wood, but a few are badly weathered, and many have the outside rings missing. Appropriate columns in the table give specific information on these points.

These specimens were dated by Dr. Douglass several years ago, and during the present work the writer has checked the dating on a number that were questionable, and has noted the dates of beginning of sapwood and other facts required in the table. Dr. Douglass has made a final re-check on all.

Site	Piece No.	Outside Dated Ring	Inside Dated Ring	Approx. Radius in mm	Kind of Wood	Type of Specimen	Sap-Heart Date	Estim. Rings Lost at Outside	No. Absent in Series	Estim. Bark Date
Oraibi	BE 4	1470	1297	90	YP	3 cores	No.	Prob. All Sap	Few near Outside	1520 \pm 20
Oraibi	BE 5	1524	1309	174	YP	Core	No.	Squared Beam	Few Near Outside	1600 \pm 50
Oraibi	BE 7	1517	1428	120	YP	V-cut	No.	All Sap?	2	1542 \pm 25
Oraibi	BE 8	1727	1616	94	DF	V-cut	1684	Few	Prob.0	1732 \pm 3
Oraibi	BE 9	1696	1618	98	YP	Core	1663	Prob.0	Fine	1696
Oraibi	BE 10	1636	1437	196	YP	Core	No.	Few	2 or 3	1641 \pm 5
Walpi	BE 11	1489	1294	175	DF	Core	1440 \pm	Few	2	1494
Sichomovi	BE 14	1611	1530	95	YP	V-cut	1550	Few	2	1614 \pm 3
Sichomovi	BE 15	1427	1310	94	YP	Section	1400	Few	0	1435 \pm 10
Sh'ngop'vi	BE 17	1637 \pm 4	1475	146	YP	Core	1519	Several	4	1645 \pm 8
Sh'ngop'vi	BE 18	1628 \pm 2	1468	112	YP	V-cut	1601 \pm	"	4 \pm	1641 \pm 10
Sh'ngop'vi	BE 19	1656	1610	36	DF	F.Sec.	1631	Few	0	1659 \pm 3
Shipaulovi	BE 21	1588	1445	140	YP	Sq.Cut	1550?	Dmgd.	4 \pm	1590 \pm 3
Shipaulovi	BE 22	1537	1336	181	YP	Sq.Beam	No.	Dmgd.	4 near Outside	1557 \pm 20
Mummy Cave	BE 34	1268	1130	75	DF	F.Sec.	1220 \pm	Prob.0	1 or 2	1268
Mummy Cave	BE 35	1275	1146	80	DF	F.Sec.	1233	Prob.0	2	1275
Mummy Cave	BE 36	1269	1193	86	DF	F.Sec.	1231	Bark Present	0	1267
Mind. 15	BE 37	1011	882	72	YP	Sq.Cut	920	Prob.2	4	1013 \pm 2
Sliding Ruin	BE 38	957	835	92	YP	V-cut	882	Prob.0	6	957
Sliding Ruin	BE 39	944	846	61	DF	V-cut	901	0	0	944
White House Pb.	BE 43	1082	972	94	YP	V-cut	999	1 or 2	1	1084 \pm 2
MV Balcony	BE 49	1190	1158	45	DF	V-cut	1168	Few	0	1200 \pm 10
MV Balcony	BE 50	1206	1148	85	DF	F.Sec.	1181	Prob.2	0	1208 \pm 2
MV Oak Tree	BE 63	1119	940 \pm	83	DF	F.Sec.	1070 \pm	1 or 2	3 \pm	1124 \pm 5
MV Spruce Tree	BE 65	1242	1186 \pm	119	DF	Sq.Cut	1224	Few	0	1247 \pm 5
MV Spruce Tree	BE 66	1244	1210	48	DF	F.Sec.	1228	0	0	1244
MV Spring House	BE 67	1113	870 \pm	133	DF	F.Sec.	No Sap	Prob. All Sap	0	1143 \pm 30
Solomon	BE 73	1086	782 \pm	120	Jnp.	1/2 Sec.	1037 \pm	Few	1 or 2	1089 \pm 3
Solomon	BE 74	1089	967	120	YP	1/2 Sec.	993	Prob.0	4	1089
Hungopavi	BE 90	941	846	121	YP	V-cut	868	Prob.0	0	941
Hungopavi	BE 94	1059	938	117	YP	V-cut	962	0	2	1059
Kiminiola	BE 96	1119	1070	89	YP	V-cut	1074	0	0	1119
Kiminiola	BE 98	1119	1058	103	YP	V-cut	1066	0	0	1119