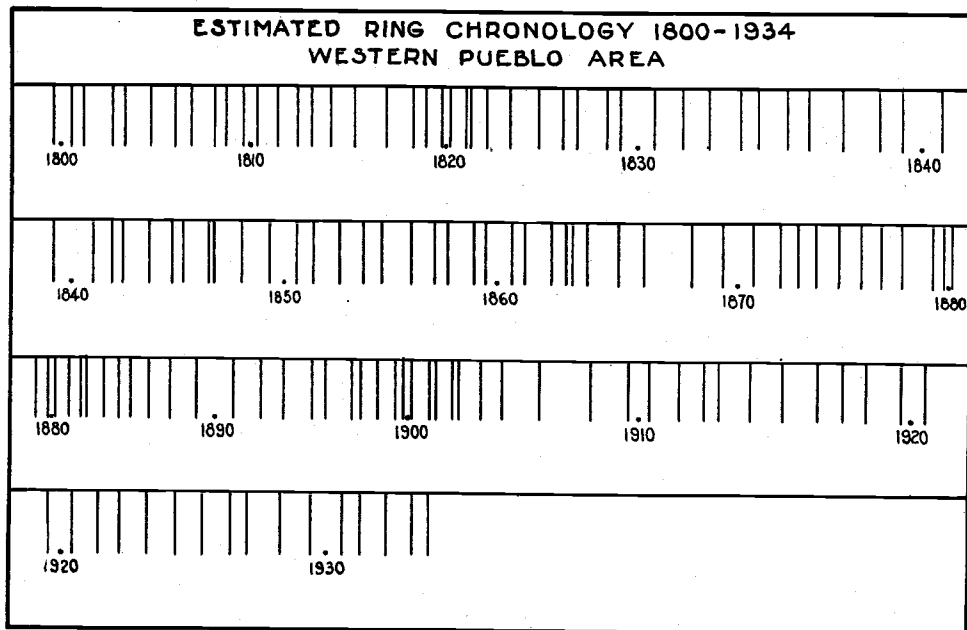


## ACCURACY IN DATING—II. THE PRESENTATION OF EVIDENCE

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.

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## 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.

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\*Numbers refer to Bibliography. \*\*Pueblo III.