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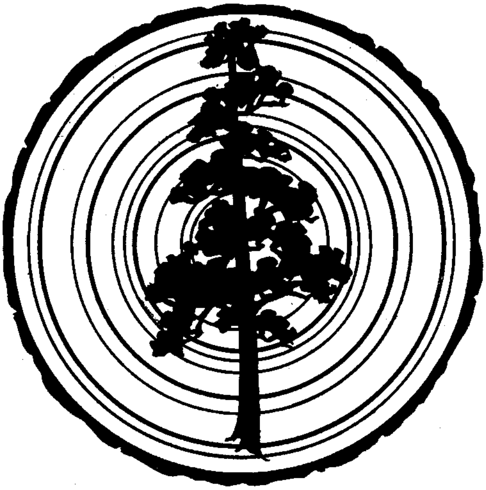

CONTENTS

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THE TREE RING SOCIETY

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BY-LAWS

Article 1—The name of this association shall be the Tree Ring Society.

Article 2—There shall be two classes of active members,
(a) those who are contributing to basic research in dendrochronology
(b) honorary members who have contributed in special ways to tree-ring studies.

Article 3—Prospective members must be proposed by two members of the society and elected by a two-thirds majority of the members present at a meeting duly called by the president.

Article 4—The officers of the society shall be a president and secretary to serve for a term of one year.

Article 5—The Tree Ring Bulletin shall be the official organ of the society, the board of editors of which shall be appointed by the president.

Article 6—These by-laws can be amended at any duly announced meeting of the society.

INFORMATION

AUTHORS

The **Tree-Ring Bulletin** will appear four times a year and will publish papers which are the results of original research on tree rings in their relation to climatology, and to other subjects. No paper which has already appeared will be accepted.

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 Vol. I. No. 1. 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.

SUBSCRIBERS

All correspondence having to do with subscriptions must be addressed to the Managing Editor, Dr. Harold S. Colton, Museum of Northern Arizona, Flagstaff, Ariz.

SOME EARLY PAPERS ON TREE-RINGS

I. J. Kuechler . . . by W. S. Stallings

More than four centuries ago, the great Leonardo da Vinci recognized the annual character of tree-rings, and even arrived at the conclusion that the relative widths of the rings of a tree provided a measure of the moisture available at the time of their formation; and so he could read in tree-rings the nature of past seasons, and learn whether they were wet or dry (1). In arid and semi-arid regions particularly, the dependence of plant growth on a supply of moisture has been of necessity apparent since primitive times, and moisture has had a more or less prominent role in doctrines of plant nutrition since the time of Aristotle and Theophrastus. Once the annual character of tree-rings was recognized, the idea of a relation between annual tree-growth and precipitation was a logical step.

In the Monthly Weather Review for November, 1893, Vol. 21, 331-332, under the section entitled "Notes by the Editor" (Cleveland Abbe) appeared the following item of interest to the history of tree-ring investigation. The article was brought to my attention by Mr. R. L. Lowry, Jr. (2).

"Col. William W. Haupt of Kyle, Hayes County, Texas, communicates the results of measurements made in 1859 by Mr. J. Keuchler, of Gillespie County, Texas. . . Mr. Keuchler seems to have adopted the idea that a tree bears the history of its climatic surroundings written in itself, and that its annual rings of growth vary in size mainly with the supply of water to the roots, so that broad rings indicate wet years and thin rings that can scarcely be distinguished with the naked eye denote dry years. Great care was taken by Mr. Keuchler in the selection of trees for his measurements. He felled three post-oaks, two of which were over 130 years old; they were located upon a high isolated position so that the drought should have an early effect upon the trees, they were also sound and healthy trees. He cut a perpendicular section from each trunk near the thick end, planed its surface very smooth and then varnished it over, which made the annual ring distinctly visible. From each section he prepared a table of relative order and position of the annual rings; upon comparing these three tables they were found to rorrespond exactly, thus confirming the idea that moisture is the principal cause of the difference in the breadth of the rings. . ."

Keuchler's final results as reported by Abbe are not as much of interest at the present time as his theory and features of his procedure for apparently he did not carry his investigations very far and his results are open to criticism in several ways. I have not been able to locate any statement by Keuchler himself. However, tree-ring investigators will recognize in the above statement of Keuchler's work interesting parallels to elementary features of present-day dendrochronology as conceived in

(1) J. Playfair McMurrick, "Leonardo da Vinci the Anatomist," Carnegie Inst. Wash. Publ. 441, p. 247, Washington, 1930. Dmitri Merejkowski gives reference to Leonardo's observation on tree-rings in "The Romance of Leonardo da Vinci"; book 10, chap. 10 in Herbert Trench's English translation (1st printing, 2 vols., G. P. Putnam's Sons, London and New York, 1902), book 10, chap. 9 in Bernard Guilbert Guerney's (The Modern Library, New York, 1928).

(2) Robert L. Lowry,, Jr., "Excessive Rainfall in Texas", State of Texas Reclamation Dept., Bull. 25, p. 2, Austin, 1934.

1901, established and developed in the details of its aspects for over a quarter of a century by Dr. A. E. Douglass. Keuchler's introductory line of thought, his consideration of local topography and drainage in the selection of trees for special sensitiveness to precipitation, and his tables "of relative order and position of rings" are noteworthy. Although Keuchler appears not to have had to contend with anomalies of missing rings and difficulty recognizable false annual rings, perhaps of most interest is the fact that he arrived at cross-identification and perceived to a certain extent its significance.

One wonders whether Keuchler continued his investigation of tree-rings as climatic indicators after his work in 1859, and whether there are still extant more detailed records of his investigations.*

*E. Antevs in an early detailed study of the literature on tree-rings (especially that in German) gave a paragraph to Keuchler (p. 366) as the first actual tree-ring investigator: in "Die Jahresringe del Holzgewasche und die Bedeutung derselben als klimatischer Indikator," Progressus Rei Botanicae, Bd. V, Pp. 285-386, 1917.—Edit.

II. J. C. Kapteyn . . . . by E. Schulman

Kapteyn (1), eminent investigator of the distribution of the stars, seems to have been among the first (2) to make any scientific study of the relation of tree-rings to climate. His long-unpublished work dates from 1880, when he collected over 50 full sections of oak from a dozen or so regions in Holland and Germany. Mean growth curves for each region were derived—most sections were measured along two to six radials. Corrections for age trend and other factors were made by substituting for the actual ring-width its percentage departure from the smoothed curve (running means of 15 terms) passed through the data; as Kapteyn points out, this incidentally eliminates all cycles longer than fifteen years.

Kapteyn appears to have fully appreciated the power of cross-dating, for he made extensive comparisons between specimens to make sure of dates. His final mean curves show remarkable agreement in detail for the interval 1640-1878. He appeals to the close relationship between tree-growth and rain to prove that no double rings disturbed the dating. By discarding specimens with highly compressed rings, he avoided errors due to "missing" rings, which in any event are relatively rare in wet-climate regions such as Germany.

Kapteyn, listing his results in the form of propositions and proofs, concludes that for the trees he has studied

1. fluctuations in growth are due largely to meteorological factors.
2. temperature exerts small influence.
3. spring and summer rain is most important.
4. increased growth is due not directly to greater rainfall but to greater height of sub-soil water.
5. one ring only was produced in each year (certainly true for the last 70 years of his data and probably true for all the preceding years.
6. a nearly constant periodicity of about 12½ years is present.

(1) Kapteyn, J. C. Tree growth and meteorological factors. Recueils Trav. Bot. Neerland, vol. 11, 1914.

(2) Leonardo da Vinci—15th century, Michel Montaigne—Voyage en Italie 1581 (this reference is found in Humboldt, Aspects of Nature, 3rd edition, trans. by Mrs. Sabine, Philadelphia, 1849, and furnished by C. G. Keenan, Tree-Ring Laboratory technician, Linnaeus, and Swedenborg, among others, appear to have mentioned

tree-rings and in passing speculated on possible relations to rainfall, topography, orientation with respect to the north and so on; similar references of even earlier date will no doubt be unearthed in time. Humboldt also cites the following as having discussed the relation of annual ring-thickness to various factors from a more scientific viewpoint (the references are not available to the present reviewer): Kunth, Lehrbuch der Botanik, 1847, t. i. s. 146 and 164; Lindley, Introduction to Botany, 2nd edition, p. 75.

Note on Kapteyn's tree-ring work. In 1911 I had the fortunate opportunity of talking with Professor Kapteyn at the Mount Wilson Solar Observatory in Pasadena. He had seen my first paper in the Monthly Weather Review, June, 1909, and because of his great interest wanted to discuss the subject. I strongly urged him to publish his measures and curves and the article above described was the result. He refers in this article to a lecture he gave in Pasadena, California, in 1908, which was published in the Pasadena Star on December 19, 1908.

In looking over Kapteyn's curves one notes that his limited groups from the northwestern areas of Germany at lower elevations show resemblance to my groups, especially the one at Eberswalde, collected in 1912 and confirmed by other collections in 1930. This location is in the lowlands of North Germany. My groups from the higher levels of southern Germany were not very satisfactory and were difficult to analyze. They were too short to have much overlapping with his.

In the earlier years of his sequences he found a 12.4-year cycle and our tests on his curves confirm this for the intervals of about 1660 to about 1790.

—A. E. DOUGLASS.

REVIEW OF SOME RECENT PAPERS ON TREE-RINGS AND CLIMATE

EDMUND SCHULMAN

The first four papers reviewed below concern themselves, in part at least, with the climatology of the Great Basin area of eastern Oregon and California, and western Nevada, a region which due to the shadowing effect of the Sierra Nevadas, is included in the dry climatic areas. On the whole the tree-ring records presented in these papers show much similarity in the growth curves. With the California and Oregon tree groups showing approximately parallel growth, published by Douglass a decade ago, they outline an unusually large area in which detailed similarities in rainfall fluctuations over several centuries may be traced. (1).

Two studies in the wet climate areas of eastern and southern United States are of special interest, for the successful dating there exhibited promises well for future tree-ring studies in similarly unfavorable regions.

Hardman, George, and Orvis E. Reil. Relationship between tree-growth and stream run-off in the Truckee River Basin, California-Nevada. Nevada Agric. Expt. Sta. Bulletin No. 141, Jan. 1936, Reno, Nevada.

An excellently carried out investigation of ponderosa pine growth from a number of sites of different altitudes in the Truckee drainage area has yielded a curve of tree-growth which seems to follow very closely the measured Truckee River runoff, and appears to permit extrapolation

(1) A considerable study of this similarity is included in an extensive report on California tree-growth now being prepared at the Tree-Ring Laboratory.

backwards for 400 years. The severe drought of the late 1500's in Arizona is well shown in this curve. The degree of cross-dating in the various groups is nowhere mentioned, but indirect evidence afforded by the high correlations with runoff indicate that it is of a very satisfactory quality.

A ponderosa pine of which the samples not quite reaching the center showed up to 685 rings is represented by a growth curve; this appears to be the longest ponderosa pine sequence yet published. There is evidence in it of the great drought in the last decades of the 1200's.

The method of smoothing used, simple three and five year running means, tends to deform the data, and has been replaced at the Tree-Ring Laboratory entirely by the running mean of three with double-weighted center term.

Jessup, L. T. Precipitation and tree-growth in the Harney Basin, Oregon. Geog. Rev., vol. 25, no. 2, 310-312, April 1935.

This short study, based on four junipers, is important as an example of the high degree of cross-dating possible in this difficult tree. The correlation of the mean growth curve with rainfall in the immediate vicinity approaches in quality the high correlations found for the yellow pine groups of northern Arizona by Douglass.

Bowman, Isaiah. Our expanding and contracting "desert." Geog. Rev., vol. 25, no. 1, 43-61, Jan. 1935.

In discussing climatic changes in areas sometimes stricken by drought, appeal is made to the records available in lake levels and tree-rings. The author points out that the recorded fluctuations in tree-growth in the Great Basin (1) indicate the recurrence of dry periods at varying intervals; the importance of this fact in the use of marginal lands and in land planning is emphasized.

Finch, R. H. A tree-ring calendar for dating volcanic events, Cinder Cone, Lassen National Park, California. Amer. Jour. of Science, vol. 31, no. 194, Feb. 1937.

Two major eruptions are dated at 1567 and 1666, by means of series of extraordinary narrow rings (presumably due to ash fall) beginning at these dates, in a 450 year pine rooted in the old soil beneath two ash deposits. While considerable additional ring work was carried out in the neighborhood to check the dating, the ring sequence of the old tree is so complacent that confirmation of the effect in other long records would be desirable.

Lyon, C. J. Tree-ring width as an index of physiological dryness in New England. Ecology, vol. 17, no. 3, 457-478, July, 1936.

Hemlock trees averaging several centuries in age are found to show excellent cross-dating. Several groups are examined from areas in Vermont and New Hampshire and show fine internal agreement. The author finds that agreement with April-August rainfall is good; he concludes that the trees give a better and longer record of the years with strikingly

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(1) Based on a superb collection by E. Tntevs in California-Oregon which was sent to the Tree-Ring Laboratory for reduction, and dated by Schulman (checked by Douglass) in 1932.

favorable or unfavorable growth conditions than do the weather records of the general area.

The publication of tables of mean tree-growth in the area would have been a welcome addition to this extensive and thorough ring analysis.

Coile, T. S. Effect of rainfall and temperature on the annual radial growth of pine in the southern United States. Ecological Monographs 6, 533-562, Oct. 1936.

Some correlations are presented between spring rainfall and tree-growth in southern Louisiana, southern Georgia and northern Arkansas; some effects of temperature are also found. The series used are, however, very short ones (17 years or less), and the trees are young and fast-growing. Thus the relationships serve only to point the direction of potentially valuable research.

Griggs, R. F. Timberlines as indicators of climatic trends. Science, vol. 85, no. 2202, 252-255, March 12, 1937.

The author emphasizes, as does Bowman in the article above noted, the changing trends of climate in short periods. The advance and retreat of the limit of the spruce forests in Alaska provide the basis of the present study.

INDEX TO VOLUME III