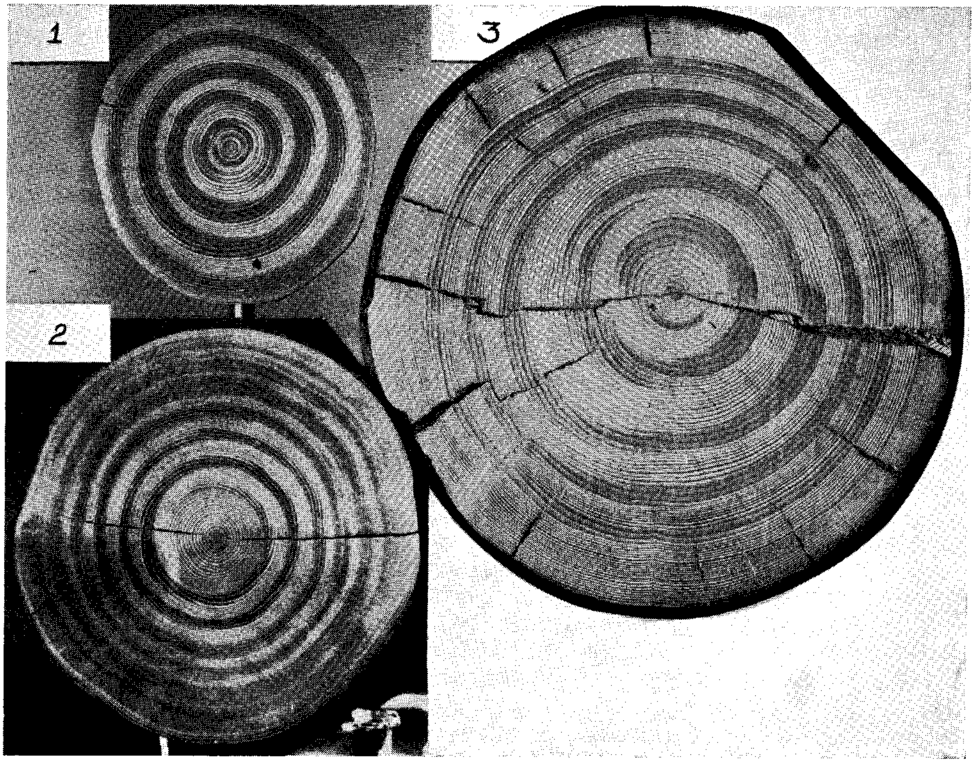
followed. Immediately outside the zone the rings may continue as wide as within the zone but lack compression wood characteristics. Soon, however, the reverse of wide-ringed zones is encountered, when the rings become narrow and abruptly converge while some disappear. In fig. 1a the spiral makes three circuits of the trunk. In another specimen recently studied eight full circuits are made. Obviously, the abnormal thickness of the growth rings in the compression wood area is not related to climatic factors, and borings into such spiralled trees are worse than worthless to a student attempting to determine a relationship between rings and climate. Fig. 1b is a pen-and-ink sketch of the area, denoted by the rectangle in fig. 1a. With a low-power hand lens the discontinuity is easily noted. Typical compression wood portions are stippled to distinguish them from non-compression wood portions.

Redwood's two-millenium span of life makes it an especially valuable tree, but obviously specimens must be selected with great care and studied with due attention to the anomalies mentioned before they can be regarded as reliable recorders of past climatic conditions.

EXAMPLES OF SPIRAL COMPRESSION WOOD

A. E. DOUGLASS

The photographs in fig. 2 show three very interesting cases of spiral compression wood. Numbers 1 and 2 show two sections in the Skogshögskolans Botaniska Avdelning, Stockholm, Sweden. Picture no. 1 was forwarded by Dr. Carl Malmström at the request of Professor T. Lagerberg;



Scale: Nos. 1 and 3 are ½ actual size, no. 2 is ¼ actual size.

Fig. 2. Photographs of cross-sections showing spiral growth of compression wood.

it is labelled "Picea Abies (L) Karst. Jämtland, 1922; H. Andrén." Number 2 is an enlargement from a kodak picture taken by the writer in 1930; it is labelled "Picea Abies (L) Karst. Mora, February 18, 1924; Magnus Nordquist." On August 20, 1930, I made the measures given below of radial distances and ring count from the center of the tree to the centers of the compression bands.

Number 3, measures below, shows an Alaskan spruce (*Picea* sp.) in the collection of Dr. Irving W. Bailey.[1] He was kind enough to give us a thin slice. From knots in it we can determine the upper surface and find rotation of this compression wood is clockwise outward when seen from above the tree, as it is in Fritz's[2] spec. 1596.

[1]See Pillow and Luxford, U. S. D. A. Tech. Bul. 546, pl. 7, 1937.
[2]Personal communication.

No. 1, 63 rings.				No. 2, 140 rings.				No. 3, 83 rings.			
To Left		To Right		Lower Left		Upper Right		To Left		To Right	
mm.	yrs.	mm.	yrs.	mm.	yrs.	mm.	yrs.	mm.	yrs.	mm.	yrs.
7	7- 8	5	5	31	27	25	21	10	8	10	7-8
15	16-17	12	13-14	43	40	38	34	23	21	20	14
22	27	20	22	55	52-53	50	46-47	42	37-38	36	30
31	41	28	34	66	70-71	62	60	52	48	48	43
		36+	56+	75	85	73	78-80	62	60	57	54
				84	103-04	83	94-95			66	65
Inside of Bark:				96 mm.		102 mm.				76 mm.	

CLIMATIC CHRONOLOGY IN SOME COAST REDWOODS

EDMUND SCHULMAN

The purpose of this note is to emphasize the fundamental difference in ring record in two general classes of coast redwood sequences. One is characterized by lack of circuit uniformity and by discontinuous rings as described by Fritz[1]—rings which often "wedge out" as a group in some small arc of the cross-section, although quite large elsewhere; it is evident that these "wedged-out" rings are *non-climatic* and have in general no relation to years of climatic stress. The other class is characterized by the usual circuit uniformity found in trees of the Southwest used in tree-ring analysis; the occasional locally-absent rings found in such records are *climatic* in origin and indicative of dry years. In such cases there is apparently insufficient food supply to permit cambial activity everywhere on the trunk. The usual "wedging-out" ring group is so different in character from the normal locally-absent *climatic* ring that it may serve as a good indicator of an unusable record.

Botanists have given much attention to the coast redwood, among them Bailey,[2] Shreve,[3] Haasis,[4] and MacDougal.[5] Shreve found much evidence in the southerly groves of non-uniformity in width of the annual ring in different directions from the axis of the tree. MacDougal points out that while Monterey pine may grow on a soil which at times has a moisture content of less than 5%, the coast redwood apparently must always tap some soil which is saturated.

Douglass[6] studied small groups of specimens from Santa Cruz and Scotia in 1921 and 1925, but found no general crossdating. More extensive and highly selected groups were apparently needed. Accordingly, in July, 1931, he collected 25 large sections and 86 cores with the cooperation of I. W. Bailey and H. L. Person. These represented substantially the whole red-

[1]E. Fritz and J. L. Averell, Jour. Forestry, 22, 31-38, 1924.
[2]I. W. Bailey, Jour. Arnold Arboretum, 15, 233-254, 1934.
[3]F. Shreve, Carnegie Inst. Wash. Pub. 350, 89-116, 1924.
[4]F. W. Haasis, Carnegie Inst. Wash. Pub. 450, 1934.
[5]D. T. MacDougal, Carnegie Inst. Wash. Pub. 462, 1936.
[6]A. E. Douglass, Carnegie Inst. Wash. Pub. 289, II, 55, 1928.