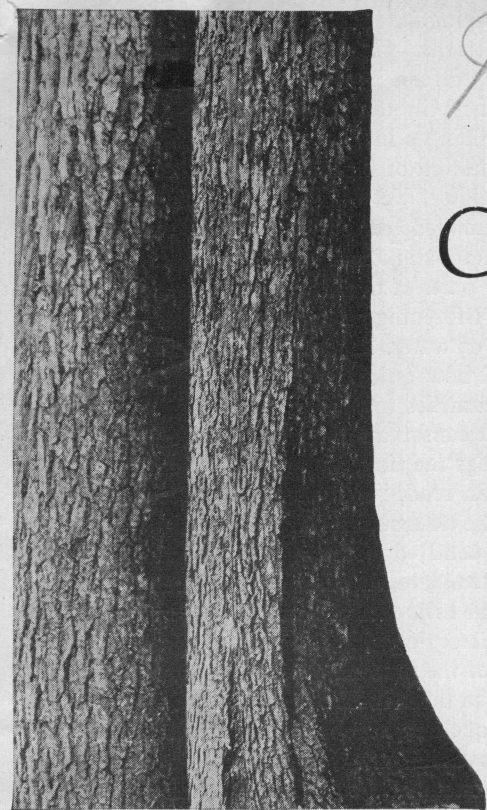


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# CLIMATE and TREES

by A. E. Douglass  
of the University of Arizona



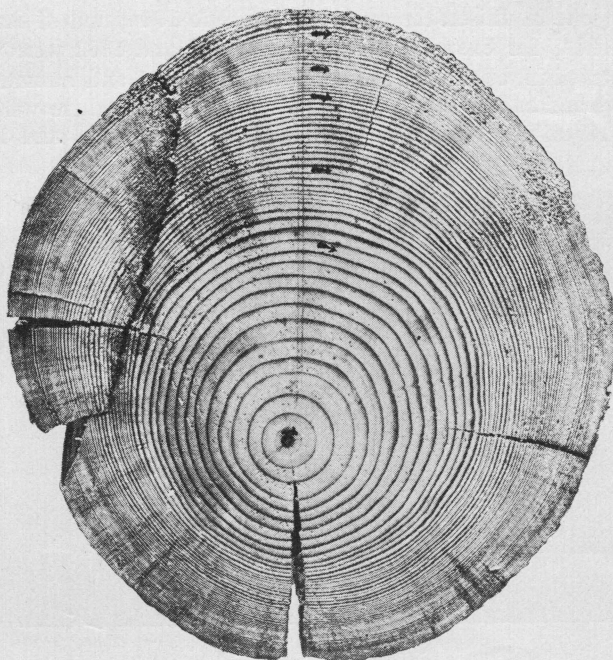
NATURE knows many languages. Like the Sibil, she has scattered the story of the world as leaves for the winds to carry to all parts of the earth. Sometimes even the savage can understand her, when she reveals herself in the voice of thunder, the crash of the surf, or the rumble of earthquake. At other times she talks in parables—in the raised beaches of San Pedro, the fossil trees of Calistoga, and in the great twisted tangles of the rocks, which tell in their upheaved layers of sandstone, granite and feldspar of long æons of heat and cold and change. For those who listen with fine instruments, she whispers of microscopic smallness, of electrons and of minute forms of life; and even from the distances of whirling nebulae and wandering comets her Babel of tongues speak out their message. And I have been learning still another of her languages—I have been studying the dialect of the trees. For it is partly through them that she relates the history of the climate of the past.

The annual rings in trees and the grain in lum-

ber are really the scars of severe winter weather which caused a cessation of growth for a time, a husbanding of energy to fight the cold. Each succession of the light and dark parts which make up a ring reveals one year's happenings. The soft, light section is the spring growth, and is large and porous to carry the sap upwards, but the late summer and autumn growth is dark, hard and

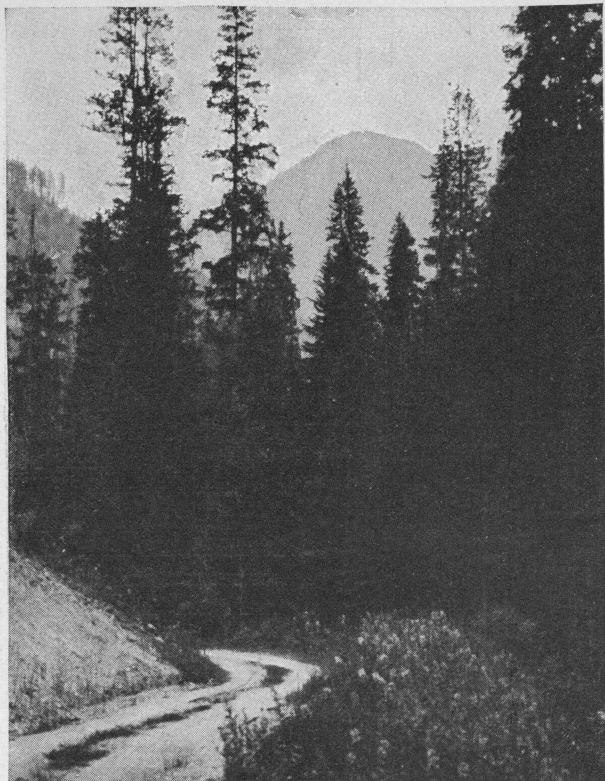
pitchy, strongly designed to give the tree strength to prevail against the winter winds and the attacking ice-gnomes. In the lands where the winter snows are abundant and the summers short but warm, the great contrasts in weather have caused the account of climatic changes to be writ large in the rings of the trees, especially in those of the cone-bearers, but in localities where seasonal differences are slight, as near the sea coast, spring, summer and autumn rings merge.

Humankind always has one topic to discuss, the weather. This community of interest has saved many friendships, and prevented innumerable arguments. Trees, likewise, record constantly their impres-



THE RINGS TELL

*The light section is spring growth, while the dark that of fall. Together, they reveal one year*



#### TONGUES IN TREES

*Wherever the climate has been the same, trees resemble each other, though sometimes hundreds of miles apart*

sions of what the elements are doing by varying the amounts of their growth in response to rain or snow or heat. It is easy to prove this truth, for we find even in great forests that in any given year all the trees take on just about the same amount of avoirdupois. Yet the only constant factor over these large areas is the climate.

There are great forests of pines covering the slopes of northern Arizona and parts of New Mexico and Colorado, and trees in all sections recite in unison the same narrative of past events. In 1904, for example, they grew but little, and the rings were thin, but in 1907 and 1909 they waxed fat and flourished as one. The Giant Sequoias in Calaveras Grove reveal the same facts as their brothers at King River and Springville, hundreds of miles southward. It is not merely that American trees are better trained as Nature's stenographers than natives of other lands. In Sweden twelve different trees were picked at random from a river-full of floating logs, yet the accounts they gave of their growth varied hardly a millimeter. Thus does Nature tell the tale of her fickle offspring, Climate, in her fashion.

Trees that are separated by great distances, how-

ever, do not speak exactly the same, any more than do provincials living in different sections. Though the Mt. Wilson, California pines resemble somewhat those of Arizona, they do not impart the same information. Perhaps differences in temperature or in growing season cause these changes in the text; or perhaps it is fog. It may be a question of the effects of different soils, or of varying humidity. Yet even when the records are confused and jumbled, certain facts shine out to indicate that the climate is much the same for these two regions.

In the dry parts of the Southwest, there is a constant struggle for life going on among the trees,—a struggle against lack of water. In wet years, the rings are large, pointing out how quickly the conifers take advantage of the opportunities to prosper; but in dry years, when only by strict conservation can feeble life be kept going at all, the rings are tiny, and sometimes entirely absent. Thus can man read, "two years ago was wet, but forty years back, the trees suffered from great thirst".

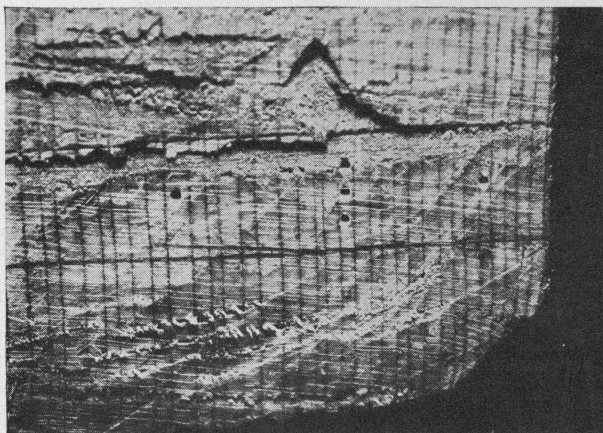
Not infrequently do trees in certain sections of different states resemble each other closely in their habits of growth. On the hills of northern Arizona, at Prescott and Flagstaff, the tree rings tell without hesitation or confusion of the rains of the preceding winter, and as these winter rains vary like those in Southern California, these same trees inform of climate in a region hundreds of miles away. The northern California trees, however, are affected by a different climate, and reveal nothing concerning happenings in the southern portion of the same state.

Thus can we read the trees. We can find in the story of their rings the records of climate for hundreds of years. We can learn of ancient rainfalls, and judge, perhaps, the future by the past. Engineers may grow to understand the dialect that Nature has spoken, and prepare their reservoirs and dams according to the predictions which the trees make. Science has secured another handmaiden.

Here are some of the facts the trees have disclosed already—yet they have only begun to talk. The Arizona forest monarchs tell in their rings of the great drought of 1899 to 1904, and of that in the early eighties. The years 1864 and 1851 were very dry over all the Southwest, they say, and human memory corroborates them. They advise that there were sultry, dry periods during 1822-23, 1778, 1748 and 1684-6. They have not lied.

For five centuries they have kept their accounts faithfully and well, like good servants of Nature—they have been her monkish penmen, writing as she dictates.

The giant redwoods in the high mountains are just beginning to yield up their long hidden records, and already they seem to indicate that some factor other than rainfall is affecting their growth. Perhaps they will show man the great forces which go to make up climate, perhaps through them, and



#### HERE THE RECORD

*The story of sunspots, drought and rainfall, of fat years and lean, is marked in the rings*

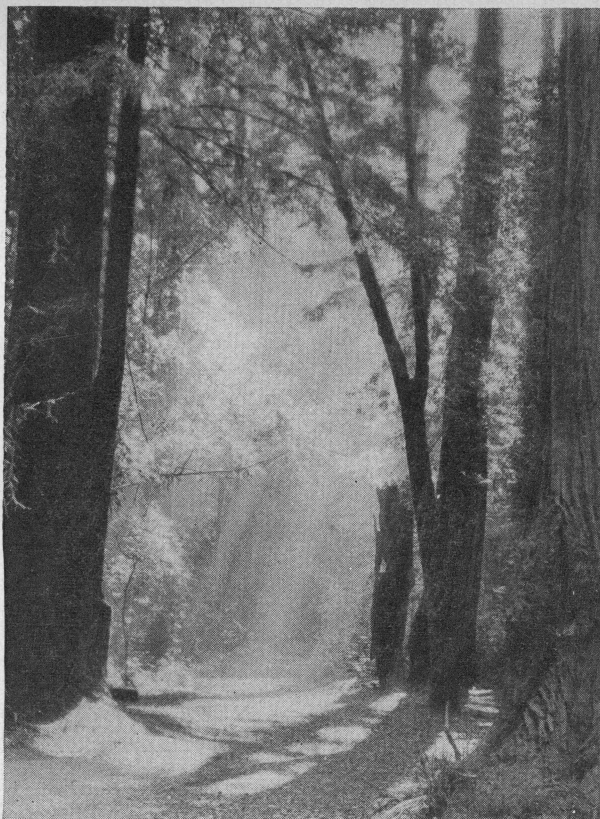


other trees, he can learn how to control the weather, and add great strides to his progress.

It was a desire to discover some causative factor behind the rainfall that sent me to the trees in quest of other information. I wanted to know more about the stars, or at least about one of the stars, the sun, which is considered to play havoc with the climate of little earth. It seemed logical that if the trees could record the rainfall, they also must contain the secrets of heat and radiation coming from the sun. I first tried to trace the periodic eleven year recurrence of great sunspot activity. Many misgivings accompanied the work, for the probabilities of error were innumerable. Tree after tree was examined. Charts were made out. Data were accumulated. And when the maze of figures and facts settled down, there stood a five hundred year record of the sunspot cycle, faithful, accurate, in accord with the findings of science with but one exception. The period from 1650 to 1725 was barren of results. Every attempt to discover through the trees that sunspots had erupted with their well-known regularity during these years failed flatly. Very discouraging. And it was not until three years later that an English astronomer, Dr. E. W. Maunder, revealed that the sunspot records prove clearly a great dearth of sunspots during 1645 and 1715. For some strange reason, the sun had not conducted itself with its customary propriety during this time and man, who works upon laws either deduced or induced, had not discovered the lapse. The faithful trees, however, who take down only what is given them, and draw no conclusions, had recorded the aberration truly and well.

Since it is easy to recognize definite years through study of trees, human history can sometimes be laid bare by reading the story of the rings. They record, perhaps, the date of a carelessly set fire, or a thinning or draining of a forest, or a flood. Sometimes they can decide certain questions of ownership. And the key to the knowledge they reveal is being carried to prehistoric ruins by Neil M. Judd of the United States National Museum to discover the relative dates of the timbers of which the temples and homes of bygone races were built. The trees will show how long it took to construct some of the great communal dwellings and at what intervals different buildings were erected. Perhaps in the future a comparison of the story of these timbers with that of the great sequoias will reveal the age of the ruins themselves.

We must look to the past to predict correctly the future, however. It is in the role of weather-forecasters that trees may be a treasure chest for science. There are minute investigations being carried on by the Carnegie Institution and the University of Arizona to make these arboreal graph sheets into practical aids for mankind. I have measured about one hundred and



#### SEQUOIA SHADOWS

H. H. DUBOIS

*For long centuries Nature has talked to these trees in her dialect, and they have marked her words*

fifty thousand tree rings, and constructed a cycloscope or periodograph to help decipher the strange hieroglyphics of the Nature dialect. Out of the mass of variation and confusion of records loom, it seems, a few cycles which appear to have relation to changes in the sun, and scientists everywhere—Clayton and Abbot in Washington; McEwen and the astronomers at Mt. Wilson in California—are beginning to forge powerful links in the chain of causation by which great forces are controlling the weather. Just the preface of the story of the rings has been read—the body of this modern Sibylline book has yet to be construed. And perhaps when it is done, not only the record of the past, but part of that of

the future, may be discovered to human beings, and weather be predictable.

Man has studied many of Nature's tongues. He has broken from her by his effort and his instruments some of her secrets which she has written down in her thousands of diaries over the face of the earth. Much yet lies hidden. But enough has been laid bare to show that man can always find

" . . . tongues in trees, books in brooks, Sermons in stones, and good in everything".



#### OLD CLUMPY ZEB

*Perhaps through him and others, the causes of climatic change may be revealed, and the future seen*



ARBOR BEAUTIFUL  
And well worth the trouble. You  
must now clip off faded flowers,  
and soak well the baked soil

H. ARMSTRONG ROBERTS

# HINTS and HELPS for Home and Garden --- July

by Harry R. O'Brien

**N**OW COMES the time of year when the faith slackens, the will weakens and the hopes of balmy spring disappear as the blistering sun sears the grass, leaves drop, fox grass sneaks ahead and rag weeds shoot up. It's easy to garden in spring—and quit gardening in July.

\* \* \*

July is probably the hardest month for gardening, unless it is August. But it is the time when the real gardener does not falter. The weeds should be kept down, the ground around the perennials in the border needs stirring. Things which have bloomed earlier should be trimmed out. If the ground gets too dry, water,—but soak, don't sprinkle.

\* \* \*

Gardeners who have clay soil that bakes hard as a brick in midsummer might find this method helpful. Just as soon as the ground can be safely worked after a rain, stir it up with a hoe before it has a chance to bake and then keep it stirred about once a week. If it bakes at any time, wet it thoroughly with the hose then the next day use the hoe.

\* \* \*

Of all the tools in the gardener's arsenal, the most valuable for July and midsummer is a little hand cultivator or fork hoe. It has a short hoe handle with four tempered steel sharp prongs instead of the hoe proper. You work it by drawing it through the ground toward you. In stirring up the ground, you can work almost as fast as you can walk and stir perhaps four or five times as much as you could with a hoe in the same time. Nurseries make constant use of this tool. It sells for a dollar or so.

\* \* \*

July is a good time to begin to get ready for fall planting of roses—which is the best time for such planting.



Begin by seeking information and reading up. The Conard-Pyle Company, nurserymen, of West Grove, Pennsylvania, have a little book, "Success With Roses", that sells for twenty-five cents. The rose catalog of Bobbink & Atkins, Rutherford, New Jersey, contains some valuable information. Farmers' Bulletin No. 750, "Roses for the Home", by the United States Department of Agriculture, is free for the asking and helpful. "About Roses", by Prof. Alfred C. Hottes of Ohio State University, has recently been revised as Bulletin No. 71, Agricultural Extension Service, of that institution. This is free and also very instructive.

## DON'T WEAKEN

*Easy to quit on hot days, but only care will grow these dahlias, or such a garden*

H. ARMSTRONG ROBERTS

