I want to tell you of a few interesting facts that I have learned concerning moisture in wood that may give a better understanding of where it is located and how it moves through wood. This should help explain why a certain board dries in a manner quite different from one that is located quite near it, whether in the air drying yard or in the dry kiln.

In the first place, the moisture content of the wood in a tree, shortly after it is felled, varies to a much greater degree than is generally recognized. The usual method of determining the estimated dry weight of a sample board by running oven moisture content measurements on two slivers cut from either end, gives the average moisture content of the slivers which may differ from the average of the sample board. This method does not bring to the attention of the kiln operator the variations in moisture content that may exist. Other methods of determining the dry weight of sample boards have been devised which more accurately determine average moisture content of the sample board but still do not bring out variations in moisture content that exist. What I want to bring out is the fact that we start with a material that has a very uneven distribution of moisture which does not dry out at the same rate and yet we endeavor to dry it so that not only is there no variation in a single board, but no difference between the individual boards as well.

In a moisture meter study conducted a few years ago by Messrs. Robert H. McAlister and Robert L. Myers of the University of Idaho, sections were cut from trees shortly after felling. These sections which were taken at different distances from the ground, were divided into quadrants and then cut into rings 2" wide. The moisture content of these segments is shown in figures 1 to 8. These show as everyone knows that the sapwood in lodgepole pine and grand fir contain
much more moisture than the heartwood, and there is less difference in black
cottonwood. It is also not surprising that considerable differences in moisture
content exist at different distances from the ground, but it should be noted
that very considerable differences exist between segments taken from the same
annual rings as, for example, figure No. 1, where the sapwood has a moisture con-
tent of 257 on one side of the tree as compared with 92 on the other. Even in
segments that are adjacent to each other, there are differences up to 37 percent.

Now, we have another situation in the seasoning of lumber which further
complicates the drying process and that is that water moves through it more readily
in some directions than in others. In the first place, sapwood dries more rapidly
than heartwood, and everyone knows that moisture moves through the end grain of a
board 10 to 20 times as rapidly as it does through face or edge grain. It is not
so well-known, however, that in most species of wood the moisture moves more freely
in the direction of the rays, that is the parenchyme cells, than it does parallel
to the annual rings. In other words, flat or face grain dries more rapidly than
edge or quarter grain. Because the moisture leaves a board at different rates de-
pending on the arrangement of the grain patterns, we find that while it is still
in the process of drying, it not only has an uneven distribution of moisture but
the highest moisture content is not necessarily at the center. Because of these
different drying ratios we find that point in the cross-section of a board having
the greatest moisture content lies on a line through the middle of the board where
it intersects the longest ray crossing the board (Figures 9 and 10).

These facts should be kept in mind in the selection of sample boards.
Because a kiln charge of lumber contains all of the wood that can be obtained
from the tree, including boards with high and low moisture content at the start—
sapwood, heartwood, edge-grain, and quarter-grain boards all mixed together, it
is good practice to use several sample boards so that they more nearly represent
the lumber being dried. These different drying rates should be kept in mind when
using a moisture meter. The meter measures the moisture content where the contact pins are driven into the wood and will detect the differences due to the varying rates of drying. When we find considerable variation in moisture content in the same board or between boards in the same charge, it indicates that seasoning is incomplete. When wood is in use, whether in building construction or in furniture, it levels off to not only a low but uniform moisture content and in the seasoning process we should try to bring it to this condition as nearly as possible. It is, therefore, more important to dry all lumber to the same moisture content as possible, rather than a low average moisture content.