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ORDERING OF SHOOTS WITH SPECIAL REFERENCE TO *EXBUCKLANDIA POPULNEA*

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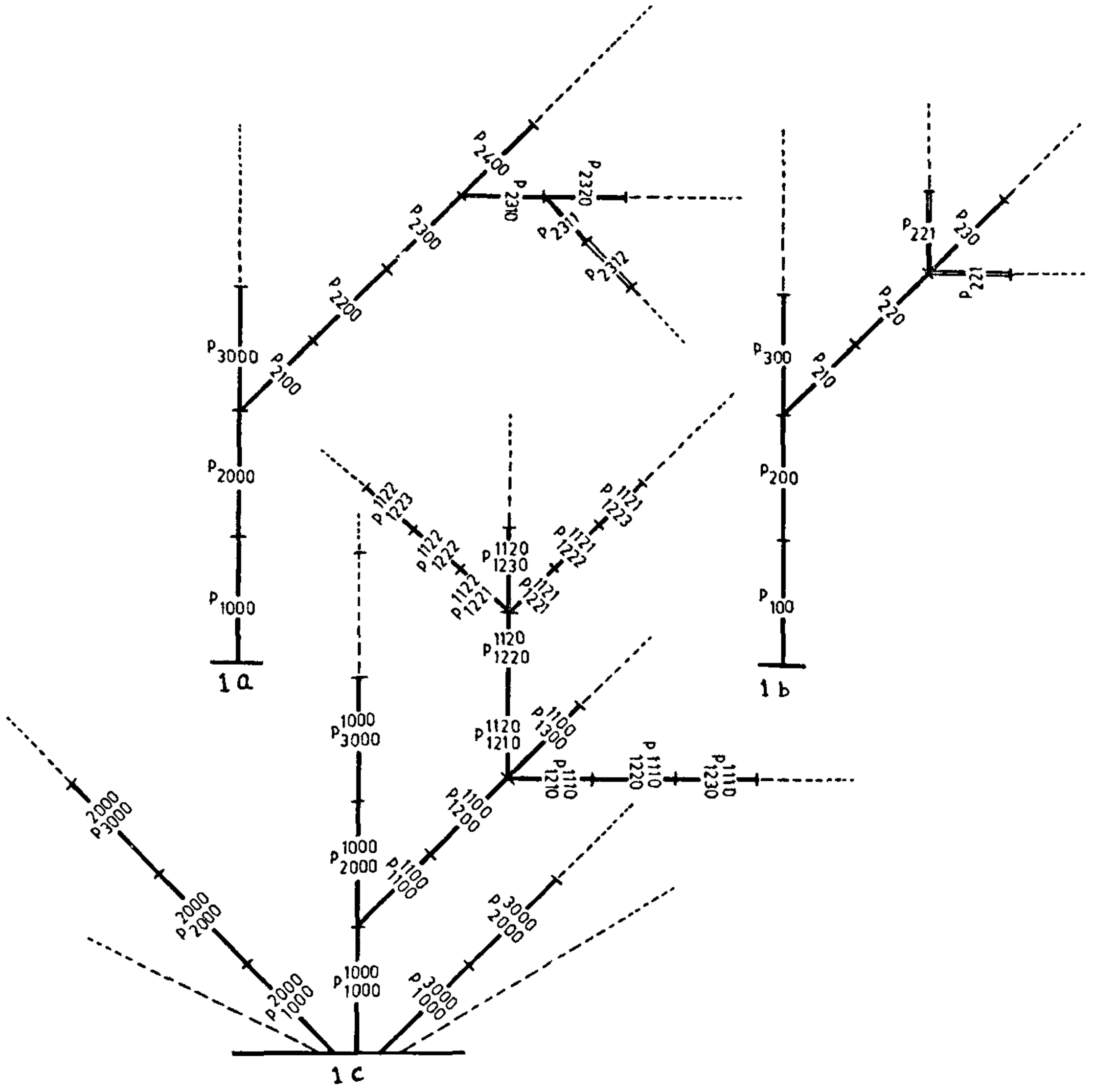
ORDERING of branches plays a very important role in determining the tree architecture. Mainly we talk about two types of ordering—botanical[1] or developmental ordering and Strahler's[2] ordering. In the latter, the terminal branches are of order 1, and two such branches meet to form an order 2 branch and so on down to the trunk. The union of an order i and order j branch is assigned order $i+1$ when $i=j$ or order max (i,j) when $i \neq j$. In botanical ordering the leader is said to be of order 1, the primary branches emerging from the leader as of order 2 and so on. This paper attempts to move a step further by ordering the individual shoots, instead of branch as a whole. The method of ordering modifies the earlier one, in its ability to identify each shoot individually with respect to its position in the canopy, its age or developmental stage. Thus, in addition to describing the tree architecture in greater detail, it also helps in recording the various characters, (quantitative or qualitative) of individual shoots. It can be used very efficiently for demographical studies of shoots or even leaves. The method has been developed with special reference to *Exbucklandia populnea* (Hamemellidaceae). Possibilities and limitations of using this method to other tree species are also discussed.

E. populnea is a medium-sized to tall tree. Our observations are based mainly on 4 to 5-year old saplings. So far, in this species we have observed branches upto order 4 (taking leader as of order 1). On these branches whorl marks are visible at the positions from where branch or branches of higher order emerge during a particular flush. The portion of a branch between two successive flushes is called a shoot. The shoots from the current whorl of all the branches bear one leaf and a stipule at the base of the petiole. Of these, one is the extension of the parent branch and the rest form branches of higher order. During the next flush, these stipules break and shoots bearing a leaf and a stipule emerge. As before, one from each stipule is an extension of the parent branch and the remaining are branches of higher and further higher orders. This is followed during each flush. However, sometimes, for higher order branches, no branch appears with further higher order; only the parent branch continues to extend during successive flushes.

From the above, it is quite clear that a tree architecture undergoes certain changes during each flush. Thus a method of ordering which is able to consider these changes from flush to flush is preferred. Its ability to identify the position of the shoots at different canopy levels is an additional quality. As mentioned earlier, instead of branches, individual shoots are considered as the final unit of ordering. Shoots of different flushes can be distinguished easily with the whorl marks formed at the place of emergence. First, we classify the shoots with respect to the order of the branch to which they belong. However, this is not just sufficient as there is more than one branch of that particular order. To locate the exact position of a shoot we make use of the fact that the nth order branch emerges from a particular position of $(n-1)$th order, which again comes from an $(n-2)$th order and so on. Symbolically, we write $p_{ijk}\ldots$, (figure 1a) to denote the order of a shoot, where i stands for the position of the shoot on the first order branch, j for the same on the second, k for the third and so on. The number of suffixes depends on the highest order of branches present in a tree. Some of the suffixes may be zero as well, *viz* p_{2100} (figure 1a). Obviously no non-zero suffix can follow a zero suffix.

In some cases, a shoot may produce more than one shoot of the next higher order. For example, p_{220} (figure 1b) produces three shoots. Clearly, one is p_{230} and the other two are p_{221}. To identify them distinctly we make an extension of the above notation by introducing a series of super suffixes—$a, b, c, \ldots$ and we write $p^{abc}_{ijk}\ldots$ which denotes ith shoot of ath first order branch, jth shoot of bth second order branch and so on. And accordingly the shoots with order P_{221} can now be identified separately as p^{111}_{221} and p^{112}_{221}. This



Figures 1a, b & c. Ordering of shoots.

new notation can be used even for ordering the shoots of sympodial plants (figure 1c).

The above method of ordering identifies each shoot with its position in the canopy and its developmental stage. It can be used for recording the various characters of individual shoots. One very important limitation is that this ordering system is applicable only when a scar mark is visible at the place of its emergence.

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