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LETTER TO THE EDITOR

Dear Editor,

The recent article "Towards a new model of branch attachment" by D. Slater and C. Harbinson (*Arboricultural Journal* (2010), *33*, pp. 95–105) criticises strongly the model of branch attachment described by Dr Alex Shigo in 1985. As I recall, my first glimpse of Shigo's model was literally drawn on the back of an airline cocktail napkin. He rushed into the lab that morning, in full flush of his "eureka" moment. At the time, I was a postdoctoral researcher with Dr Walter C. Shortle who was part of Shigo's team at the US Forest Service. The ballpoint sketch showed the key elements of overlapping branch and stem tissues, with the vasculature of branch and stem continuous only on the underside of the branch.

For me, one crucial difference between the 1985 and 2010 publications rests on the distinction between codominant stems (referred to as "forks" in the recent article) and branches. Codominant stems arise from multiple buds at the shoot apex or the fusion of appressed shoots. Branches arise from lateral or epicormic buds. Slater and Harbinson maintain that for arboriculture, the distinction is arbitrary and solely determined by the relative size of the two joined members. For them, the shape of the surfaces or "topological equivalence" is critical. I agree that most of the mechanical load of a uniform column is borne by the outer circumference. But the relative strength of the branch attachment is due to the overlapping stem and branch tissues which are absent in codominant stems (E. Gilman. (2003) *Journal of Arboriculture*, *29*(5), pp. 291–293).

Shigo emphasised that unlike the codominant stem crotch, the branch base contains constitutive and inducible boundaries that facilitate branch shedding and resist the spread of infection. This distinction is a reason to avoid tree topping and the removal of large codominant stems (which have no collars) versus acceptable pruning cuts to the outside of the branch collar. Such "natural target pruning cuts" as promoted by Shigo minimise injury to stem tissue and the loss of the protection zone at the branch base. Distinguishing intact codominant stems from branches can be difficult (A. Shigo (1986) *A New Tree Biology*. Fig. 12-12).

The substantial difference in structure of the attachments of branches and codominant stems is readily seen in dissection. Of course, the practicing arborist or student can't dissect every encountered union, but transverse and axial dissections of a few of each with proper interpretation would make clear that the differences are not merely of relative size of the joined members.

A complete point-by-point response to Slater and Harbinson (2010) is not possible in this space, but that may not be necessary. Some of the difficulties come from simple language usage. The recent article points to the obvious attachment at the upper side of a branch and stem as refutation of Shigo's description of the connection being exclusively beneath the branch. For Shigo, connection always meant communication or flow. Back in the old days of wired telephones, lack of a phone connection didn't mean the absence of wires, just that no message was flowing through them! The lack of connection described

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for the upper part of the branch/stem union referred to the lack of flow in the plumbing of the wood, not the absence of contact.

Other difficulties come from the artistic limitations of representing the four-dimensional process of growth at the branch/stem union in two dimensions. The “tail” to which Slater and Harbinson refer to in Shigo’s illustration is simply the growth increment which is continuous and confluent through the lower portion of the branch and the stem. Conceivably, that connection could be drawn to the root collar, but would make the illustration unwieldy. Shigo had the illustration drawn to show the length of connection along the stem axis to be in the same proportion as for branch knots in decaying logs.

The biomechanics of trees has a lot to teach us and we have a lot to learn! We don’t have to blindly accept old teaching just because of tradition. Nor do we need to jump on the latest bandwagon that passes by. The challenge for the practitioner and the student is to understand the biological context for the elegant mechanical engineering that enables trees to survive and thrive.

Dr. Kevin T. Smith
Plant Physiologist and Project Leader, Research Work Unit NRS-10 USDA Forest Service