



## Phylogenies with Corroboration Assessment\*

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Mooi & Gill (2010) argued that careful character study and well-understood synapomorphies do not have the strong role that they deserve as the basis for evidence in phylogenetics. We agree, but suggest that the problem is even greater. Not only character synapomorphies, but also other forms of phylogenetic evidence, typically do not receive the critical assessment that would support phylogenetic inference. In this paper, our goal is to not simply to highlight problems but to suggest solutions. We will suggest that a stronger role for corroboration assessment in systematics could overcome these problems in phylogenetic inference.

Mooi & Gill's paper raised many topics for debate. We will focus on the substantive issue raised in their provocative paper—a perceived tension between the role of careful character study (particularly to establish synapomorphies) and the role of “optimization” in phylogenetic inference. Mooi & Gill argued that the understanding of a synapomorphy does not have the bearing that it deserves on the inference of phylogeny, as when optimization turns a well-understood synapomorphy/homology into homoplasy. They concluded that a crisis in phylogenetic systematics exists because (p. 38):

“Optimization does not differentiate between homology and nonhomology; resulting topologies are “solutions” to datasets that have not taken the foundations of phylogenetics into account.”

We agree that there is an issue here, but we are troubled by some of Mooi & Gill's specific conclusions. They argued (p. 38): “The unavoidable conclusion is that optimization does not produce trees based on identified homology, so is not a phylogenetic method” and that (p. 38): “the only evidence for phylogenetic relationship is homology represented as synapomorphy.”

Clearly, Mooi & Gill would limit the permissible phylogenetic evidence to well-understood synapomorphies, so that the careful study of characters would have a stronger role in phylogenetic inference. We think that this same goal could be promoted with a nearly-opposite approach. There would be no *a priori* restrictions on the form of phylogenetic evidence, but there would be a requirement that all such supporting evidence be exposed to a sceptical assessment that, in effect, tries to “explain the evidence away”. Such assessments would help ensure that well-understood characters have the bearing that they deserve on the inference of phylogeny.

The particular kind of assessment that can accomplish this is called “corroboration”. Faith (2004) summarised the debates about the role of corroboration in systematics, and described a possible corroboration assessment process (p. 3):

“Suppose that some apparent positive evidence for an hypothesis has been put forward. To judge how well that evidence supports the hypothesis, we can try to explain that evidence away, that is, account for it by possible explanations other than the hypothesis of interest. If, and only if, we fail we can say that the hypothesis has gained Popperian corroboration from that evidence (Faith 1992). That failure to explain the evidence away may be quantified by finding that, although alternative explanations can be put forward, the observed evidence is quite improbable by these alternative explanations.”