



## Corroboration assessments and recent progress towards integrative systematics: a reply to Farris and Carpenter

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As part of the *Zootaxa* special issue on molecules and morphology in systematics, Faith *et al.* (2011) discussed how corroboration assessment can support integrative systematics. They argued that integrative systematics should be open to a wide variety of potential supporting evidence for phylogenetic (or species) hypotheses, with the condition that (p. 52) “there would be a requirement that all such supporting evidence be exposed to a skeptical assessment that, in effect, tries to ‘explain the evidence away’”. Faith *et al.* (2011) argued that corroboration assessment provides this critical examination of evidence, capturing the idea that supposed supporting evidence for an hypothesis is only impressive to the extent that the evidence cannot easily be accounted for by other factors, including chance. This characterization accords with Popper’s (1983: 238) idea that evidence that truly corroborates an hypothesis ‘should be improbable on our background knowledge’ (for discussion, see Faith 1992; Faith & Cranston 1992; Faith 2004, 2006).

The examples for Strepsiptera in Faith *et al.* (2011) were intended to illustrate how a greater *improbability* of the supporting evidence for a phylogenetic hypothesis actually means greater corroboration. For example, the good fit of molecular data to the Strepsiptera–Coleoptera tree provided corroboration for that hypothesis because it was judged improbable that evidence so good could have resulted merely from long-branch attraction or poor taxon sampling (Faith *et al.* 2011). Thus, the supporting evidence was improbable because elements of background knowledge—long-branch attraction, poor taxon sampling, and other factors—could not “explain away” that evidence.

Faith *et al.* (2011) observed that, while this kind of critical examination of supporting evidence can be found, at least on some occasions, in evaluations of phylogenetic hypotheses, such corroboration assessment is still not a well-established part of systematics. Indeed, following the initial proposals (e.g. Faith & Cranston 1991, 1992; Faith 1992), this interpretation of corroboration has prompted debates over the past 20 years. Faith (2004: 2) reviewed these controversies:

“In the early debates concerning the role of Popperian philosophy, referred to above, corroboration was never linked to any quantification of improbability of evidence. This essential property of Popperian corroboration seems to have been unappreciated in systematics before the arguments put forward by Faith (1991a, 1991b, 1992) and Faith and Cranston (1991, 1992). This more recent focus on improbability of evidence promotes an inclusive, not exclusive, framework for systematics. Faith (1992) and Faith & Cranston (1991) argued that the supposed philosophical stamp of approval for cladistics, and its dramatic methodological directives, followed from equating the data with the Popperian evidence and then equating one appealing goodness-of-fit criterion (cladistic parsimony) with ‘corroboration’. In the inclusive approach, the evidence for a phylogenetic hypothesis is typically a measure of the goodness-of-fit of the observed data to the tree hypothesis (not the data itself). Corroboration of a phylogenetic tree hypothesis is given by improbability of that goodness-of-fit (not goodness-of-fit itself). Improbability means that it is difficult to explain fit that good by other factors, including elements of chance, that collectively make up ‘background knowledge’. Faith & Trueman (2001; see also Faith 1992) described corroboration in general terms: ‘corroboration assessment requires only the goodness-of-fit or other evidence associated with any phylogenetic method, and background knowledge, which also can take various forms (Faith 1991b, 1992; Faith & Ballard 1994).’”

Thus, this use of corroboration assessment for an “inclusive” or integrative approach departs from some long-standing philosophical positions about evidence and hypotheses in systematics. It is not surprising then that our recent paper (Faith *et al.* 2011) has prompted further criticisms. In their new critique, Farris & Carpenter (2012) claim that there is no validity in the link from corroboration to a process of seeking alternative explanations for evidence, because it is a “drastic misunderstanding of Popper” that leads to “a thoroughly unsatisfactory approach to scientific investigation” (p. 62). They argue that our advocated process of attempting to “explain away” evidence confuses Popper’s background knowledge with “alternative explanations”—equated by Farris & Carpenter with any explanations that disagree with