Dear Pr. Futuyma,

We are happy to inform you of our decision to submit our manuscript entitled *Coevolution leaves a stronger imprint on interactions than it does on community structure* for publication in *PNAS*. We believe that our manuscript will be of general interest to *PNAS*'s readership for the following reasons.

Understanding the structure of complex networks is a key research topic in ecology, sociology, physics, and many other fields. At its most fundamental level, the way in which present-day network structures have emerge is more important for us to truly understand the systems these networks describe. In ecological communities, observed networks are the end results of species evolution and/or coevolutionary processes between species. We demonstrate here that the importance of individual interactions for coevolution can easily get lost if we naively assume that coevolution is necessarily a community-wide phenomena. This result implies that many network studies stand to benefit from a fundamental shift of focus from the networks themselves to the impact of their individual components.

There is persistent debate between evolutionary biologists and ecologists about the degree to which the structure of ecological communities is the result of coevolution in the past or ecological processes in the present. One of the few points that are mutually agreed upon is that species-species interactions are the key driver underlying both phenomena. Moreover, the effects of antagonistic interactions---such as those between predators and their prey or parasites and their hosts---are considered to be particularly important because the "stakes" are high for both types of organisms involved.

Over the past five years, a series of papers have laid the groundwork for the strong relationship between species' evolutionary history and interaction networks (*e.g.*, Rezende et al. *Nature* (2007), Gomez et al. *Nature* (2010), Stouffer et al. *Science* (2012)). In almost all cases, however, these studies have focused on phylogenetic conservation of species' interactions---the idea that closely-related species tend to interact with similar species. Notably, these studies all drew implicit or explicit parallels to the idea of coevolution, despite the fact that testing for coevolution explicitly imposes additional, higher-order constraints; any test of coevolution therefore provides a more rigorous appraisal of the role of evolutionary history on species-species interactions. Nevertheless, a comprehensive investigation of how coevolution acts on the structure of species-species interactions has been lacking. This is the gap that our manuscript fills, and, as such, we firmly believe that our present manuscript represents a crucially important step forward.

In our study, we apply cutting-edge methods to quantify the coevolutionary signal in interaction networks from an unprecedented dataset of host-parasite interactions on a continental scale. With this combination of techniques and data, we test a variety of commonly-held but seldom-tested coevolutionary hypotheses. We highlight the fact that what we think we understand about coevolution has been shaped more by the spatial scale of our observations than by systematic testing of hypothesized impacts of coevolutionary mechanisms. Intriguingly, we demonstrate that particular species-species interactions are able to maintain their coevolutionary signal even when they are woven into a community that does not. Overall, our results suggest that the best way forward in coevolutionary studies is to understand how network structure affects coevolution, and *not* the other way around.

Below is the *Statement of Significance* for our manuscript:

Every ecological community is ultimately the outcome of evolutionary and coevolutionary processes in the past and ecological processes in the present. Previous studies have described the way that extant interactions can be captured by knowing species' evolutionary relationships while failing to quantify whether coevolution between these species underpins this observation. Here, we demonstrate how the fingerprint of coevolution is eroded away by distinct ecological processes, but also show that this signal is most manifest in interactions as opposed to whole networks. This implies that network structure is the most parsimonious mechanism by which coevolution proceeds and not the imprint it leaves on ecological communities.

Our submission includes the main manuscript (2500 words with four embedded figures totalling five panels), and one CSV file of Supplementary Information. All data and code used to produce the manuscript will be made available online.

The following scientists have the technical skills and expertise to be ideal reviewers of this work:

- Pr. Pedro Jordano, jordano@ebd.csic.es
- Pr. Scott L. Nuismer, snuismer@uidaho.edu
- Pr. Rod Page, r.page@bio.gla.ac.uk

Thank you for your consideration of our manuscript,

Dr. Timothée Poisot