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Editorial

Morphology and integrative phylogenetics

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Since Willi Hennig laid the foundations of phylogenetic systematics in 1950, this field has undergone remarkable progress. While the goals of phylogenetic systematics have remained unaltered — classifications that reflect the genealogical relationships of organisms — the employed methods and datasets to achieve this have profoundly changed. Hennig's original method, the "*a priori* polarization of characters" has been largely replaced or supplemented by a cladistic ("*a posteriori*") polarization of characters and the analyzed data sets, which used to be mainly based on morphology, now largely rely on molecules. In contrast to this, Hennig (1950, 1966) farsightedly advocated an integrative phylogenetic approach that includes all available data sources (see also Wheeler et al. 2013). However, sound morphological data can only be retrieved from detailed comparative studies. Today, such studies are substantially underrepresented in the biological literature, probably because they are time-consuming and generally not considered as "high-impact science". Complex morphological character systems are not only an important source of phylogenetically relevant data their comparative study also allows unique insights in the evolution of characters in response to adaptations of species to different lifestyles.

Insect Systematics and Evolution provides a platform for comparative morphological approaches to insect phylogenies and will publish a series of subject issues on the phylogenetic implications of complex morphological character systems. The current issue focuses on insect male genitalia, which represent one of the most widely used character systems in insect systematics. There are several reasons why male genitalia deserve to be the first choice for the aforementioned series of subject issues. First of all, male genitalia have been used for insect taxonomy across all major insect groups and they are extremely

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useful for species identification as well as higher-level classification. There is even a dedicated reference book by Tuxen (1970) entitled, "*Taxonomists Glossary of Genitalia in Insects*" which should be in the book shelf of every working insect taxonomist. Secondly, male genitalia are the subject of major theoretical controversies. In terms of comparative morphology, it is still unclear whether male genitalia are derived from appendages or abdominal outgrowth (Scudder 1971) and the homology of individual components of male genitalia across different insect orders (sometimes even within an order!) is still not fully understood. In terms of evolutionary biology, the study of genital evolution is one of the most active areas of research (Hosken & Stockley 2004). There is a remarkable diversity in male genitalia (Eberhard 1985) and many species have species-specific genitalia and the morphological divergence is often dramatic among closely related species. The current research paradigm for genital evolution is sexual selection perspective (Eberhard 1985), although there is an ongoing debate on which mechanism (female choice or sexually antagonistic coevolution) is responsible for the genital evolution (Arnqvist 2004; Eberhard 2005). Thirdly, a recent synthesis by Song & Bucheli (2010) has strongly suggested that male genitalia evolve both slowly and rapidly because genitalia are composite characters by definition. The components that are physiologically or functionally constrained evolve relatively slowly and the components that are under sexual selection evolve rapidly and this pattern has been shown empirically at least in one system (Rowe & Arnqvist 2011).

These points collectively demonstrate that the study of morphology is still very relevant and important and we hope that this issue can re-invigorate the field of integrative phylogenetics. We dedicate the current subject issue to the memory of Willi Hennig, eminent insect taxonomist and founder of modern phylogenetic systematics, who would have turned 100 on 20 April of this year.

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