Bees and flowers, an old love story

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Lanthanomelissa betinae—Tapinotaspidini, Apidae: Female collecting pollen and oil from *Sisyrrinchium* flowers. Male of *L. betinae* on *Oxalis*

In 2015, we lost two great scientists: Prof. Charles Duncan Michener and Prof. Paul Stefan Vogel. Both were naturalists that knew everything, like an encyclopedia. But besides their huge knowledge, they were very humble

In honor of Charles Michener and Stefan Vogel.

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gentlemen, who always loved to hear and learn new information about their organisms.

In the case of Prof. Michener, his lovely organism was the **bee**. He was really a lexicon for bees, but not only for a few groups of Apiformes: he knew the taxonomy, biology, behavior, life history, and parasites of all the bees in the world. He named and described more than 600 bee species, and wrote a masterpiece on bees (about 1000 pages), appropriately named “The bees of the world” (Michener 2000).

In the case of Prof. Vogel, he loved the **flowers**. He discovered many of the floral syndromes which we are still studying. He had a feeling for finding new floral rewards, or plant strategies for attracting pollinators. When he found for example that flowers could also produce oil instead of

nectar (Vogel 1969, 1974), he wrote not less than three books on this case (besides many research papers), where he presented all the interesting aspects concerning this floral resource.

Vogel and Michener published together a paper on this theme, presenting the extraordinarily long forelegs of the bees *Rediviva emdeorum* and *R. longimanus*, from South Africa, associated with equally long oil-producing floral spurs of *Diascia longicornis* (Vogel and Michener 1985)—a beautiful example of morphological co-adaptation.

Michener and Vogel achieved in their over 90 years a very productive career, leaving an immense knowledge about these two wonderful organisms: bees and flowers. We are lucky to have the achievements of these two scientists in biology.

The history between bees and flowers is old. Estimates point to the end of the Mesozoic Era, which correspond to the Cretaceous period. The appearance of flowering plants is estimated at about 160 million years ago, together with many insects, including bees, in the same evolutionary scenario. Plants provide food for the bees, and on the other hand bees help the flowers in reproduction, making sure that the pollen is spread from flower to flower to produce the seeds. Bees are either beneficial, or actually essential for pollination, and therefore for the sexual reproduction, of much of the natural vegetation of the world, as well as for many agricultural crops. The interaction of these two groups is an old and successful story, which keeps on producing good fruits (literally!).

In tribute to the two great naturalists, Michener and Vogel, an entomologist and a botanist, passionate for bees and flowers, nothing is more appropriate than a special issue of the journal *Arthropod-Plant Interactions*. For that we invited colleagues who worked directly or indirectly with the honored scientists. The adhesion was immediate, and we compiled 19 articles in this special issue. The first two papers present a short biography of our honored

professors. Michael Engel and Regine Claßen-Bockhoff showed us their wonderful life dedicated to science, nature, family, students, and knowledge dissemination. Then, we have a series of articles dedicated to specialized interactions involving a specific bee or plant species, where the bee behavior or bee biology, as well as the plant morphology or phenology are guiding the mutual relationship. This row of presentations includes different approaches like classic pollination studies, or broad spatial and temporal analyses. Beside bees, we have a new case of ant-pollination in *Asclepiadoideae*, a plant group that Prof. Vogel loved so much, and had worked on under many aspects. Then, we have also some papers dealing with the population or community levels, where the strategies of the involved organisms are also taken into account for the accomplishment of the interaction. At the end, an important discussion of yield trends of insect-pollinated crops is presented. We are sure that Prof. Michener and Prof. Vogel would love to read these news.

We are grateful to the colleagues who promptly organized their articles for this SI, and also to the many reviewers who carefully revised the manuscripts.

We hope you enjoy the reading, and help us in keeping our world flowering!

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