

Awards and Citations

Presentation of the 2022 Paleontological Society Medal to Conrad C. Labandeira

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I am honored to present Dr. Conrad C. Labandeira of the Smithsonian Institution as the recipient of the 2022 Paleontological Society Medal. Conrad has innovated a distinct field of study from the ground up, focusing on the fossil record, evolution, and extinction of plant-insect associations in terrestrial ecosystems. Insects and plants are Earth's most biodiverse organisms, and their interactions define much of our world. Thus, Conrad's numerous breakthrough discoveries and prolific output have an outsized impact on our understanding of the past, present, and future biosphere. Conrad's research accomplishments and outstanding mentoring record with a long series of young academics on nearly every continent have earned him this recognition at the top of our discipline.

When I met Conrad in the mid-1990s, he had just quantified insect diversity through time with Jack Sepkoski (Labandeira and Sepkoski, 1993) and discovered diverse leaf mining on the oldest angiosperm-dominated floras (Labandeira et al., 1994). However, Conrad was only beginning to build a career repertoire that grew to embrace all time periods, types of fossil evidence, and methods, from core systematics to paleoecology and data-rich evolutionary paleobiology. From brainstorming deep in the Smithsonian collections 25 years ago, Conrad and I bootstrapped the now widely used damage-type system for categorizing and quantifying insect-feeding damage on fossil leaves. Conrad's use of the damage-type method included a paper in PNAS that stood for years as the only evidence showing significant insect extinction at the Cretaceous-Paleogene boundary (Labandeira et al., 2002). That study used 13,441 leaf fossils that Conrad scored for the presence or absence of 51 damage types, and students still examine his annotation slips at Denver and Yale. However, that effort was only a tiny piece of the global dataset that Conrad built by hand on plant-insect associations through time, which number far into the six digits of specimens. In fossil plant collections and herbaria worldwide, from Silurian to Recent, there are similar annotation sheets in Conrad's instantly recognizable handwriting, many with small, precise drawings that preserve his primary observations onsite. Conrad's office is full of his intricate camera-lucida drawings of the most informative specimens that he has examined from everywhere imaginable, not to mention the most extensive natural history library I have ever seen in one person's office. On every field

trip, even in this digital age, Conrad brings a suitcase of heavy monographs to read in the middle of nowhere.

One of Conrad's most memorable graphics, often used in his talks, is a characteristically information-rich research roadmap. The figure (e.g., Labandeira, 2006: fig. 1) summarizes the fossil record of plant-insect associations against the geologic time scale, using over 100 plant and insect exemplar fossils coded by category of evidence. Much of this diagram represents Conrad's breakthrough discoveries with colleagues around the world, demonstrating his holistic and revolutionary methods for reconstructing food webs through time. Examples of this approach include an early record of arthropod herbivory on liverworts from the Devonian of New York (Labandeira et al., 2014) and an incredible fossil of a Carboniferous holometabolous larva (Haug et al., 2015). A suite of spectacular lacewing and scorpionfly fossils from the Mesozoic of northeastern China demonstrated that insect pollination and even the feeding and camouflage adaptations seen in living butterflies were in place tens of millions of years before butterflies or flowers (Ren et al., 2009; Yang et al., 2014; Labandeira et al., 2016).

This citation lists just a few examples from his ~200 peer-reviewed papers of how Conrad innovates vertically through time and horizontally, integrating many kinds of fossil evidence from plants to insects in each time period. He is the only person to synthesize this entire picture into one remarkably successful research program on the evolution of the plant-insect system. His work appears in many textbooks (e.g., Grimaldi and Engel, 2005; Taylor et al., 2009) and will remain influential for decades. Conrad's successful and diverse students, grand-students, and great-grand students, far too numerous to list here, multiply his impact. Conrad Labandeira is a world-class paleontologist and educator who deserves this highest honor of our Paleontological Society.

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