Department of Entomology
College of Natural and Agricultural Sciences
University of California, Riverside

Presents

The 2026 Alfred M. Boyce Lecture

By

Dr. Armin P. Moczek
Department of Biology

Indiana University

"On the origins of novelty and diversity in development and evolution: insights through the study of horned beetles

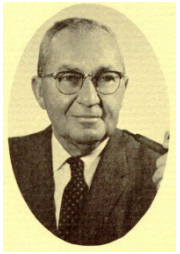
In-person and live remote seminar

Location: 1102A Genomics Auditorium
Date: Monday, June 1, 2026
Time: 4:00 pm - 4:50 pm

For remote viewing at the same time and date

Zoom: 943 6687 2379
Passcode: 453393

A reception will follow the seminar at 5:00 p.m.
at the Department of Entomology Courtyard



Alfred M. Boyce
1901-1997

Dr. Alfred M. Boyce began his career in entomology at Cornell University where he earned his B.S. degree in 1926, and M.S. in 1927. In September 1927, he came to the UC Citrus Experiment Station, Riverside, with the appointment of junior entomologist, and he earned his Ph.D from Berkeley in 1931. Dr. Boyce remained on the UC Riverside faculty until his retirement in 1968. He became Professor of Entomology and Entomologist in the Agricultural Experiment Station in 1943. In 1940, he was appointed head, Department of Entomology; in 1952, he became Director of the Citrus Experiment Station, and in 1960, he received the honorary L.L.D. degree (Doctor of Laws Honoris Causa).

During the 1930's and 1940's, Boyce worked on all the insect and mite problems affecting the extensive walnut industry (then over 100,000 acres in southern California), and developed new and/or improved chemical control measures for many species. One of the most exhaustive studies in economic entomology ever made and published by a single entomologist up to that time was his "Bionomics of the Walnut Husk Fly, *Rhagoletis completa*," UC Hilgardia, October 1934. This species was new to science.

Boyce undertook research on insects and mites affecting the citrus industry (then over 300,000 acres) in 1928, which continued until the early 1950's. One of the early successes was the discovery and development of a new dinitrophenol compound for control of several species of mites on citrus and walnuts. This was the first commercially successful organic acaricide for foliar use. Four patents were obtained from this and other research, all dedicated to the public.

Early in his research, he foresaw the need for knowing the fate of chemicals applied to crops - what residues are left and whether they could be harmful to man and other animals. In 1932, he set up a laboratory for residue chemistry, which has since been greatly expanded at UCR.

While Head of the Department of Entomology, Boyce greatly expanded research in many areas, particularly the relatively new areas of insect toxicology, physiology and resistance to insecticides. Because of its eminence in these and other areas of entomology, the UCR Department of Entomology came to be acknowledged as one of the foremost in the world.

Boyce was also greatly interested in biological methods of controlling insect and mite pests. During 1951, he explored many parts of southern Asia, the Middle East, Africa, and Mediterranean countries for beneficial insects that might control scale insects, important pests on many tree fruit crops. He found several new species of parasites and, in conjunction with entomologists at UC Berkeley, two of these were reared and released and have provided a classical example of biological control.

During Boyce's 25 years of active research, he found many new species of insects and mites. Four were named for him when described by specialists. They are *Rhagoletis boycei*, *Parlatoria boycei*, *Cupes boycei*, and *Eriophyes boycei*.

Dr. Boyce was involved in teaching and for many years taught a course in subtropical entomology.

Dr. Boyce's national and international reputation as an entomologist and expert on pesticidal chemicals led to several high appointments: as a consultant to the President's Science Advisor in matters relating to agricultural research; as an advisor to the National Academy of Sciences on pesticides; member of the National Advisory Food and Drug Control, Department of Health, Education and Welfare; consultant to the Foreign Agricultural Service, U.S. Department of Agricultural; and The Rockefeller Foundation's board of agricultural consultants.

Boyce's autobiography was published in 1987, entitled, "Odyssey of an Entomologist - Adventures on the Farm, at Sea, and in the University."

The UC Regents established the Alfred M. Boyce Chair in Entomology at Riverside, an endowed Professorship. The chair is presently held by Dr. Ring Cardé.

Dr. Armin P. Moczek

I am an evolutionary developmental biologist broadly interested in understanding why and how developmental evolution has unfolded the way it has, why and how novel complex traits originated when they did, and the future of developmental evolution on a rapidly changing planet. In all of this I pay particular attention to the mechanisms and consequences of developmental plasticity, which growing evidence implicates as a key enabler of evolutionary diversification. More recently I have also become interested in symbiosis and niche construction as additional facilitators of evolutionary change. Lastly, in a somewhat parallel life I study – in collaboration with colleagues at IU's School of Education – the teaching and learning of complex systems in young children, and am heavily invested in science outreach and minority recruitment into STEM.

I have arrived at my research foci through a combination of luck, serendipity, and occasional planning. As a Masters student at the Julius Maximilians University in Würzburg, Germany, I was originally trained as a tropical biologist and worked on the ecological mechanisms maintaining arboreal arthropod diversity in the canopy of tropical rainforests in Sabah, Borneo from 1992-94. I had always been interested in behavioral and evolutionary ecology but this interest did not flourish until I had the opportunity to visit Duke University's Zoology Department first as an exchange student 1994-95 and then while conducting my PhD '96-02. Here I became introduced to types of research and ways of thinking entirely new to me, including the notion that one could learn something fundamental about the evolutionary process by understanding how organisms build themselves through ontogeny. In 2002 I then moved to the University of Arizona as a NIH funded Postdoctoral Excellence in Research and Teaching (PERT) fellow. Here, Lisa Nagy provided me with the key opportunity to begin developing molecular genetic resources for horned beetles system. This was another critical event, at a critical time, without which my research would not be where it is now. Thanks to Lisa, and with additional input and encouragement from Diana Wheeler, I learned to also think like a molecular biologist and developmental geneticists, within the I ever growing framework of evo devo. The resulting combination then provided the starting point for my research group at IU which took its baby steps in the Fall of '04.

On the origins of novelty and diversity in development and evolution: insights through the study of horned beetles

The origin of novel traits is among the most intriguing and enduring problems in evolutionary biology. It is intriguing because it lies at the heart of what motivates much of evolutionary biology: to understand the origins of exquisite adaptations and the evolutionary transitions and ecological radiations that they enabled. It is enduring because it embodies a fundamental paradox: on the one hand, Darwin's theory of evolution is based on descent with modification wherein everything new, ultimately, must come from the old. On the other hand, biologists are captivated by complex novel traits precisely because they lack obvious homology to pre-existing traits. How, then, does novelty arise from within the confines of ancestral variation?

Combining approaches from evolutionary developmental genetics, behavioral ecology, and microbiology my research explores the genetic, developmental, and ecological mechanisms, and the interactions among them, that promote innovation and diversification in the natural world. Most of the work in my research group focuses on the inordinately diverse and bizarre horns of scarab beetles, while side projects have explored the origins of light-producing organs in fireflies as well as the exuberant helmets of treehoppers. In my talk I will first present recent results on the role of developmental repurposing in the evolution of novel morphological traits and developmental functions. In the second half I will discuss the significance of host microbiome interactions and environment-engineering in the origins of novelty, when collectives innovate, adapt and problem-solve in ways single species cannot. Throughout my talk I use our findings to highlight where I believe they expand and revise our current understanding of the genesis of novelty in evolution.