Awards and Citations

Presentation of the 2020 Schuchert Award of the Paleontological Society to Lee Hsiang Liow

Scott Lidgard

Field Museum of Natural History, Chicago, IL 60605 <lidgard@fieldmuseum.org>

Lee Hsiang Liow keeps surprising me in astonishing ways. When she arrived at the University of Chicago in 2000, her prior work mostly had to do with birds, bees, butterflies, mangroves, and conservation biology. Who would have guessed she'd end up in paleobiology? I became her PhD advisor, though truth be told, Leigh Van Valen may have had as much influence as I did. A bit later on, I received an unexpected invitation to a classical music recital at the University, featuring violinist Jacob Schiff and pianist Lee Hsiang Liow. Who knew!? I can report here that it was a delightful performance. Lee Hsiang wanted to work on something nobody else was studying, and seemingly out of the blue, we were talking about living fossils. In "Do deviants live longer?" (such a colorful title!) and related papers she demonstrated that long-lived taxa are indistinct from the average morphology within a clade, rather than being extreme or deviant (Liow, 2006). Her thesis was an inventive brew of novel quantitative methods that would become a hallmark of her work.

Bear with me while I indulge myself with something I've witnessed during the Paleobiological Revolution. Paleoecology arguably has been around since the end of the 19th century, and geologists have been compiling lists of fossil occurrences since the early middle part of that century. But broad quantitative analyses of major temporal and ecological trends in the fossil record were seldom seen when I started out in the early 1970s. Things have changed. Rigorous quantification of biodiversity, morphology, and ecology is an essential part of the paleontological canon, and Lee Hsiang has become an intellectual leader in analytical paleontology. Now she is actively conveying paleontological research to the greater pool of ecologists and evolutionary biologists as senior editor at *Methods in Ecology and Evolution*.

Lee Hsiang really came into her own while a researcher at the Centre for Ecological and Evolutionary Synthesis in Oslo, reshaping tools, models and concepts from ecology and evolutionary biology to dissect the fossil record. There isn't space here to enumerate all of her accomplishments, but a few that stand out are assessing the symmetric waxing and waning of species occupancy as competitors arise during a clade's duration (Liow and Stenseth, 2007), and exploring further the implications of Van Valen's Red Queen hypothesis (Liow et al., 2011). Several nominators and I believe that her novel approaches to reveal causality in paleontologic time series—especially capture-mark-recapture (CMR) and multivariate linear stochastic differential equations (Liow and Nichols, 2010;

Reitan and Liow, 2017; Hannisdal and Liow, 2018)—are among the most thought-provoking to date, pointing a way forward for our discipline. Borrowing loosely from one of her nominating letters, "The real strength of CMR is not in estimating rates over time—which other methods do just fine—but in that it allows for a flexible modeling framework to consider rates as functions of other variables, such as climate or body size. This really opens the door to rigorously testing very interesting macroevolutionary questions, such as: Do extinction and origination rates vary with body size (Liow et al., 2008) or behavior (Liow et al., 2009)? Do sampling probabilities vary with facies (Liow, 2013)? And, did bivalve diversification influence brachiopod diversification, or vice versa (Liow et al., 2015)? These aren't cases of applying a new method for its own sake; rather, all these questions would have been hard to answer in as convincing a manner using more standard paleontological tools."

Simply viewing the titles of her publications makes it clear that Lee Hsiang is not tied to any one clade. Instead, she has a decidedly question-driven approach, carefully selecting model systems and collaborators such that necessary taxonomic and technical expertise is present to deliver robust and well-informed results. In 2016 she received a massive European Research Council award, the most prestigious and competitive grant in the European science system. It was a very pleasant surprise that the project focuses on bryozoans. Though they are notoriously difficult to work on, bryozoans are my favorite group and one Lee Hsiang had avoided while she was my student. Bryozoan overgrowths offer one of the few instances in the fossil record where competition can be reliably demonstrated. She and her large group of collaborators are generating important new data from the field and the lab, documenting the outcome of competitive interactions at the species level through an exquisitely complete Neogene sequence in New Zealand, and tracking how such interactions change over time (Liow et al., 2016, 2019). And surprise again, her lab is one of only two in the world rapidly building a comprehensive molecular phylogenetic framework for bryozoans!

Importantly, Lee Hsiang has not been seduced by the lure of pure theory. Her work retains strong ecological grounding and an empirical sensibility, which comes through in her many collaborations in modern as well as fossil contexts, and her incorporation of both biotic and abiotic interactions. Lee Hsiang is strikingly original, and I have no hesitation whatsoever in saying that, among others at her career stage, she is among the

top quantitative paleobiologists worldwide who are at the cutting edge of work on evolutionary rates, extinctions, and macroevolution, and on the border of paleobiology and evolutionary ecology.

On behalf of all of her nominators, it is a pleasure to present my friend and accomplished colleague, Lee Hsiang Liow, for the 2020 Charles M. Schuchert Award.

October 26, 2020

References

Hannisdal, B., and Liow, L.H., 2018, Causality from palaeontological time series: Palaeontology, v. 61, p. 495–509.

Liow, L.H., 2006, Do deviants live longer? Morphology and longevity in trachyleberidid ostracodes: Paleobiology, v. 32, p. 55–69.

Liow, L.H., 2013, Simultaneous estimation of occupancy and detection probabilities: an illustration using Cincinnatian brachiopods: Paleobiology, v. 39, p. 193–213.

Liow, L.H., and Nichols, J.D., 2010, Estimating rates and probabilities of origination and extinction using taxonomic occurrence data: capture-mark-recapture (CMR) approaches: The Paleontological Society Papers, v. 16, p. 81–94.

Liow, L.H., and Stenseth, N.C., 2007, The rise and fall of species: implications for macroevolutionary and macroecological studies: Proceedings of the Royal Society B: Biological Sciences, v. 274, p. 2745–2752.

Liow, L.H., Fortelius, M., Bingham, E., Lintulaakso, K., Mannila, H., Flynn, L., and Stenseth, N.C., 2008, Higher origination and extinction rates in larger mammals: Proceedings of the National Academy of Sciences, v. 105, p. 6097–6102.

Liow, L.H., Fortelius, M., Lintulaakso, K., Mannila, H., and Stenseth, N.Chr., 2009, Lower extinction risk in sleep-or-hide mammals: The American Naturalist, v. 173, p. 264–272.

Liow, L.H., Van Valen, L., and Stenseth, N.Chr., 2011, Red Queen: from populations to taxa and communities: Trends in Ecology & Evolution, v. 26, p. 349–358.

Liow, L.H., Reitan, T., and Harnik, P.G., 2015, Ecological interactions on macroevolutionary time scales: clams and brachiopods are more than ships that pass in the night: Ecology Letters, v. 18, p. 1030–1039.

Liow, L.H., Di Martino, E., Voje, K.L., Rust, S., and Taylor, P.D., 2016, Interspecific interactions through 2 million years: are competitive outcomes predictable? Proceedings of the Royal Society B: Biological Sciences, v. 283, p. 20160981.

Liow, L.H., Reitan, T., Voje, K.L., Taylor, P.D., and Martino, E.D., 2019, Size, weapons, and armor as predictors of competitive outcomes in fossil and contemporary marine communities: Ecological Monographs, v. 89, p. e01354.

Reitan, T., and Liow, L.H., 2017, An unknown Phanerozoic driver of brachiopod extinction rates unveiled by multivariate linear stochastic differential equations: Paleobiology, v. 43, p. 537–549.