Meet Dr. Charles Loh, Thieme Chemistry Journals Awardee 2026!

Dr. Charles Loh *obtained his PhD at the RWTH Aachen University (Germany) in 2013. From 2014 to 2016, he conducted postdoctoral research at the University of Toronto (Canada). He started his independent career at the Max Planck Institute of Molecular Physiology (Dortmund, Germany) as a research group leader (2016 to 2024). Since fall 2024, he joined the University College Dublin (Ireland) as an assistant professor of synthetic organic chemistry.*

Thieme: Which field of organic chemistry are you interested in the most and why?

Dr. Loh: My research group is interested in the interdisciplinary domains intersecting catalysis and stereoselective carbohydrate synthesis. To support our mechanistic discovery efforts, we harness physical organic chemistry techniques for mechanistic elucidation.
The fields of specialist carbohydrate chemistry and mainstream catalysis have traditionally been segregated. Coming from a catalysis-trained background, I came to appreciate that both domains share much more commonality that often perceived. In particular, organic chemists seek to construct carbon-based bonds more effectively and with higher stereoprecision in both communities. Instead of labelling sugars as overly sophisticated molecules, I believe that more synthetic chemists should embrace carbohydrates as a unique molecular platform for novel mechanistic discovery. This is where I believe the exciting part of catalytic carbohydrate synthesis begins.

Thieme: Following that, what is the focus of your current research activity?

Dr. Loh: The core of our research is the catalytic exploitation of highly directional non-classical interactions known as “σ-hole based interactions” as a mild and robust strategy for catalytic glycosylations and site-selective carbohydrate functionalizations. This arena is now commonly known as the “σ-hole based catalytic glycosylation strategy” and is intensely pursued by many colleagues worldwide.
We are pleasantly surprised that these long-neglected weak interactions offer a water-tolerant and functionally robust catalytic platform that is amenable on many sugar substrates. Furthermore, our research group also discovered seminal instances where σ-hole based catalysis defined new mechanistic pathways distinctive from classical Lewis/ Brønsted acid activation.
A second research axis of our group is the harnessing of asymmetric catalysis to simultaneously tackle multiple site-/diastereo-/enantioselectivity dimensions in carbohydrate functionalizations of minimally protected sugars.

The major deviation from classical asymmetric catalysis lies in the fact that the chiral information on the catalyst is leveraged for precise functionalization of complex chiral biomolecules, instead of chirality creation from achiral substrates.

Thieme: What do you think about the modern role and prospects of organic chemistry?

Dr. Loh: Organic chemistry is more relevant than ever. The modern arsenal of organic chemistry is an elegant amalgamation of multiple vibrant chemical disciplines – ranging from inorganic chemistry, photoredox chemistry, physical chemistry, computational chemistry to quantum chemistry, and the list goes on. New perspectives and dimensions in modern organic chemistry are constantly being shaped by creative young organic chemists worldwide, as inquisitive minds keep pushing the frontiers of what was previously perceived as impossible. It is fascinating to witness the enormous advancements in organic chemistry in the last decade, which would not have been conceivable without a renewed appreciation of the innovative aspects of multi-disciplinary research. I am convinced that the best of organic chemistry is yet to come!

Thieme: Which difficulties are there for young upcoming chemists in your field? Do you have any tips?

Dr. Loh: The key challenge is to keep ourselves mentally fit and abreast with the rapidly changing landscape of organic chemistry. This would require an open-mind of learning and "re-learning" knowledge that lies out of our doctoral and post-doctoral training. The willingness of young chemists to move beyond our comfort zones and to innovate at the interface will be critical in writing the next chapter of synthetic chemistry.

Thieme: What is your most important scientific achievement to date and why?

Dr. Loh: My most significant achievement to date is the development of the "σ-hole-based catalytic glycosylation strategy" (*Acc. Chem. Res.* **2025**, *58*, 2124–2144).
What makes this approach particularly exciting is our discovery of reversible iterative σ-hole activation. We observed this phenomenon operating across multiple elementary steps of the catalytic reaction coordinate. Even more intriguing was the detection of this phenomenon across different types of σ-hole interactions, highlighting its generality. This was a breakthrough because it didn't just offer a new synthetic tool; it fundamentally advanced our understanding of how σ-hole based non-classical noncovalent interactions can be harnessed to solve long-standing stereoselectivity problems in carbohydrate chemistry.
I believe this work opens a precedent demonstrating how carbohydrate substrates can be exploited as a mechanistic discovery platform. By using them to probe novel catalytic contexts, we can uncover broader organic chemistry phenomena that have been previously overlooked.

Thieme: Could you tell us something about yourself outside the lab, such as your hobbies or extra-work interests?

Dr. Loh: I am a family guy who enjoys quality time (a luxury considering my busy schedules!) with my child and my wife. I love learning languages and experiencing different cultures, which probably explains my approach in asking scientific questions at the boundaries of different scientific communities. Besides that, I enjoy listening to retro-music from the 1990s, such as NSYNC, Backstreet Boys, Spice Girls and dance hits; this brings back great memories of the fantastic once-in-a-lifetime music scene of my teenage years.