Young Career Focus: Prof. C. Rose Kennedy (University of Rochester, USA)

Background and Purpose. SYNFORM regularly meets young up-and-coming researchers who are performing exceptionally well in the arena of organic chemistry and related fields of research, in order to introduce them to the readership. This Young Career Focus presents Prof. C. Rose Kennedy (University of Rochester, USA).

Biographical Sketch

Prof. C. R. Kennedy

C. Rose Kennedy earned her BS in chemistry in 2011 from the University of Rochester (USA) where she conducted research with Professor Kara L. Bren (bioinorganic chemistry) and Professor Alison J. Frontier (organic synthesis). She then moved to Harvard University (USA) as an NSF Graduate Research Fellow, where she worked with Professor Eric N. Jacobsen. As a PhD student, she elucidated key mechanistic features of H-bond-donor ion-pairing catalysis and developed new design principles for enantioselective catalysis through synergistic ion binding. In 2017, she moved to Princeton University (USA) as an NIH NRSA Postdoctoral Research Fellow with Professor Paul J. Chirik. As a postdoc, she leveraged mechanistic insights to develop catalytic methodology for upgrading unactivated olefins through the formation and control of metallacyclic intermediates. Rose returned to the University of Rochester in January 2020 to launch her independent career as an Assistant Professor in the Department of Chemistry. There, the Kennedy Research Group combines mechanistic elucidation with catalyst design and synthetic methodology development with an eye towards sustainability. Since starting her independent career, Rose has been recognized with the ACS PRF Doctoral New Investigator Award (2020), the Packard Fellowship in Science & Engineering (2022), the NIH Maximizing Investigators' Research Award (2023), and the Thieme Chemistry Journals Award (2023).

INTERVIEW

SYNFORM *What is the focus of your current research activity?*

Prof. C. R. Kennedy My research team is focused on mechanistic elucidation and catalyst development to achieve efficient syntheses of organic molecules, large and small. We take inspiration from the cooperative reactivity principles utilized by Nature's most efficient catalysts (enzymes) to guide our efforts. In that spirit, our projects are focused largely on using terrestrially abundant elements (including transition metals, alkali metals, and main-group elements) to access unique reactivity patterns with abundant carbon building blocks. We aspire to develop generalizable principles that enable widespread application for synthesis towards a sustainable and healthy society.

SYNFORM *When did you get interested in synthesis?*

Prof. C. R. Kennedy I first became interested by synthesis when I completed second-semester introductory organic chemistry with an outstanding instructor (and now also my colleague and mentor!), Professor Alison Frontier. I was enthralled with the molecular-level insight that an understanding of simple organic reaction mechanisms afforded in the context of biological systems. I was even more excited by the process of using those same mechanistic principles to solve synthetic "puzzles" by working through multiple possibilities to identify the best possible path to a target. The problem-solving aspect of synthesis is still what I enjoy most about the field. As I have developed more laboratory research experience, I have come to enjoy the day-to-day aspects of synthesis as well. I still find it incredibly satisfying to track a "spot-to-spot" transformation on a TLC plate, see a clean baseline in an NMR spectrum, weigh out my product as a pile of pristine white powder, or collect vividly colored blocks after a successful recrystallization.

SYNFORM *What do you think about the modern role and prospects of organic synthesis?*

Prof. C. R. Kennedy In my opinion, organic synthesis is expanding to become a transdisciplinary tool rather than a discrete subfield. The development of efficient methods for constructing organic small molecules and macromolecules plays a critical role in progress toward addressing the grand challenges facing society. From producing and storing clean energy, to manufacturing and recycling materials, to nourishing our population through agriculture and medicine, we rely on access to organic molecules to answer cutting-edge questions and meet societal needs. Innovating in sustainable synthesis toward these varied targets thus enables ripple-effects across allied fields and society more broadly as we work toward a more sustainable future. While the day-to-day tasks and tools of the trade are continuing to evolve as automation increases, the need for ingenuity in synthesis remains! I think it's an incredibly exciting time to be a synthetic chemist!

SYNFORM *Could you tell us more about your group's areas of research and your aims?*

Prof. C. R. Kennedy Our specific projects are always evolving, but our current areas of focus include (Figure 1):

- Development and application of multi-functional ligands for complex carbon–carbon and carbon–heteroatom bond formation[1,2]
- Utilization of carboxylic acid derivatives as abundant coupling partners for fine chemical synthesis and sustainable (de)polymerization strategies[3]
- Elucidation of the selectivity controlling features of catalytic CO_x valorization
- Manipulation of electromagnetic fields for reactivity and selectivity control in organic reactions.[4]

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

Prof. C. R. Kennedy I enjoy making things on a macroscopic scale, too! I invest a lot of my time outside of work on projects to restore my 103-year-old home and cultivate an organic vegetable garden. There's nothing like using a sledgehammer or power tools to relieve some stress, and it's so rewarding to finish a project and know that "I made that!"

SYNFORM *If you had not become a chemist, what other profession do you think you would have entered?*

Prof. C. R. Kennedy I was on the pre-med track before the siren's call of chemistry lured me to a research career. I was interested in becoming an infectious diseases physician because

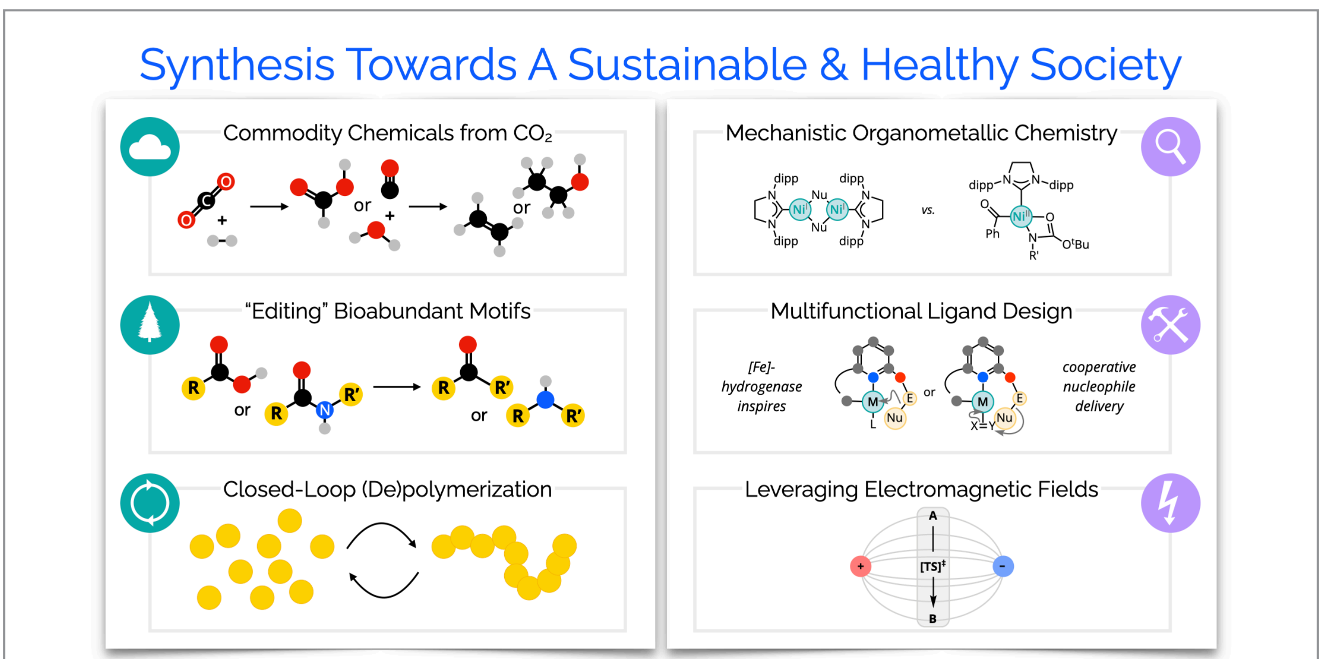

Figure 1 Synthesis towards a sustainable & healthy society

I envisioned that I would be able to use my problem-solving skills to help people in need and contribute to the development of next-generation therapeutics. Luckily, I have found that my path in chemistry has also allowed me to impact the lives of those around me positively and contribute to pharmaceutical development in other ways!

SYNFORM *What is the most exciting aspect of your job, the one you like the most?*

Prof. C. R. Kennedy My favorited aspect of my job is working with my postdoctoral, graduate, and undergraduate mentees. In addition to the intellectual thrill of working through differential hypotheses, teasing apart complicated data, and brainstorming innovative research directions together, I find it incredibly rewarding to see my trainees grow as independent scientists. I am immensely proud of them and look forward to supporting their journeys toward their own professional aspirations. I also appreciate how they challenge me to be a better, more thoughtful scholar and mentor, so we are all growing together!

Matteo Zanda

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