ACS central science

EDITORIAL

The Joy of Synthesis

As an ABC (American Born Chinese) growing up in the United States, holidays at home tend to have an East meets West flair. Thanksgiving in particular is Mom's favorite holiday, as it gives the family the chance to have turkey at noon and then Chinese food in the evening, because she still insists that any meal that doesn't include rice is not a real meal but simply a snack, and she wants to make sure we actually eat something that day. Like many families, we learned how to brine and cook a proper turkey using the *Joy of Cooking*, a classic staple in the cookbook annals, which to this day makes me appreciate the power of sodium chloride and water to make almost anything taste better.

Chemistry is often compared to cooking, but what people are really referring to is that synthesis is like cooking. You want to find the right ingredients, mix them in the right ratios at the right temperature at the right time, and create something brand new that is more than the sum of the individual parts. In a nutshell, that's what chemists do and that's what makes chemistry unique. In many ways food is the best way to communicate the impact of synthesis to a broader community, as it speaks to both function and aesthetics in a way that is both personal and universal. Everybody needs to eat, but the quality, variety, and innovation in the food and the journey to get to those final products make it a uniquely human experience. Moreover, just like you don't have to be an expert chef or even a simple cook to consume and enjoy food, you don't need to be a chemist to use, appreciate, and benefit from the products that chemistry gives back to society.

But the implicit, underlying message is that chemistry and synthesis go hand in hand, and you can't have one without the other. While chemistry is the central science, synthesis is central to chemistry. And because synthesis is limited only by our imagination, then it really shows how rich the present and future of chemistry is and can be. There are so many open frontiers to address, like can we develop methods to specifically make and/or break bonds between any and all elements in the Periodic Table? Can we create or find receptors to selectively recognize these elements in the environment or in our bodies? Can we make nanomaterials where we can control the precise shape and morphology of the same atomic composition in one, two, or three dimensions? Can we make other biomolecules like proteins and glycans with the same automation and fidelity that are possible with nucleic acid structures? Can we make truly living structures with the ability to heal and replicate, or create hybrid structures between living and nonliving components? The list could go on and on.

Finally, I want to emphasize that although functional applications and technologies that grow out of the products of synthesis are exciting and important, the act of synthesis itself is a worthwhile endeavor. I still remember the excitement of making my first brand new molecule in the old 321 Noyes lab: a manganese-nitrido complex that precipitated as perfect, jewel-like emerald-green crystals from a mud-like sludge reeking of bleach and ammonia. It didn't matter that this complex had potential applications for catalytic C–N bond-forming methodologies or as multielectron redox shuttles for solar cells. It was the simple thrill of making something new, to be the first person to create and bring a new form of matter into the world, no matter how big or small. It's the simple joy of chemistry, the joy of synthesis. And I for one am thankful to be a part of that experience.

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Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

Published: November 25, 2015

DOI: 10.1021/acscentsci.5b00355
ACS Cent. Sci. 2015, 1, 409–409