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For the 60th Birthday of Eiichi Nakamura

This special issue of *Chemistry–An Asian Journal* celebrates the 60th birthday of a great Japanese chemist, Eiichi Nakamura. As I look at Eiichi's career, I see an eye for design, a desire to understand, and a variegated, witty way to engage form and function in molecular matter. I also perceive in his work a modern turn for organic chemistry.

In the beginning, Eiichi was the latest in a striking line of ingenious Japanese organic chemists. In their hands, meticulous attention to detail in the tuning of reagents and conditions has given the community a cornucopia of reliable synthetic procedures of great utility. A substantial segment of the name reactions of the second half of the 20th century are Japanese; the 2010 Nobel Prize in Chemistry is one recognition of this remarkable line of fine chemists. Eiichi Nakamura's stay in the Stork group put him on a like trajectory.

On his return to Japan, and in his first years at the Tokyo Institute of Technology, Eiichi took the first of several turns. He and his able co-workers accompanied their synthetic studies with quantum chemical calculations on their reactions, in particular on the mechanism of organocuprate reactions. The theoretical organometallic chemistry they did, a strand of which continues to this day, was excellent; the advantage the Nakamura group had over other theoreticians then beginning to think about organometallics and their reactions was that Eiichi knew intimately the relevant chemistry. His group's theoretical work, first class as theory, somehow had more than a touch of realism.

Nakamura's reactions were becoming part of the toolkit of organic chemists. At this point, roughly at the time he moved to the University of Tokyo, *Todai,* he took another reasoned turn in his work, to look at the functionalization of buckminsterfullerene and related structures. What caught my attention, after his spectacular synthesis of one and two ferrocene units built on a buckyball, was the following remarkable series of reactions: First one end of C_{60} was functionalized, taking advantage of the specific eclipsing feature of substituents added to the polyhedron around a five-membered ring. And then the process was repeated at the other end of the buckyball. Effectively, two ends of the polyhedron were saturated, leaving behind a belt of conjugation, an entirely new structure, which also could be thought of as the simplest nanotube.

When I saw this synthesis, my mind went through the equivalent of clapping its hands in joy. The product was fascinating, the approach to it as elegant as it was surprising.

I think Eiichi Nakamura's work on fullerenes, nanohorns, carbon shuttlecocks, and nanotubes is witty. It is in no way light, for the concepts he invents for the modification of these structures are highly intellectual, and the chemistry as intricate as it could be. What I mean by witty is the following: The cleverness of Eiichi Nakamura's reactions, the beauty of the way he takes advantage of structure and reactivity, the ingenuity of his molecular constructs, elicits in the chemical observer (unless they are his competitors) a smile. Simply of the joy that it could be done. And done so neatly, so cleverly.

There is fun in the pentapod sprouting buckyballs. And functional fun in a tetrathiolene attached at each end to cobalt atoms, that in turn hold on to two substituted buckyballs. Incredible! And "cool."

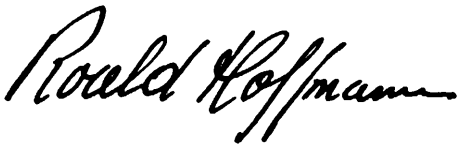
Perhaps it is like hearing him play the *flauto traverso*, Bach's flute, in a Telemann trio sonata, likely joined by his wife Yoko on viola da gamba. It looks easy, and, even as we

Eiichi Nakamura with his wife Yoko

know how difficult that passage is, we smile as we hear the satisfying resolution of a complex line of counterpoint.

The same combination of ingenuity, elegance, and chemical wit marks the more-recent collaborations of Eiichi Nakamura with talented electron microscopists. They allow us to see, really see, a long-chain hydrocarbon gyrating inside a nanotube, two buckyballs fusing, a simple hydrocarbon chain passing through a nanopore.

There's a new turn in the making in Nakamura's work. This is the design of electronic function in organic molecules. The transistors, memory devices, gates, and circuits of the future will make use of the flexibility of function and geometry, the fine-tuning that the logic of substituents gives. They will be inorganic and organic. Eiichi Nakamura is making sure organic chemists are there, defining the emergent phenomena of the chemistry of the 21st century.



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