

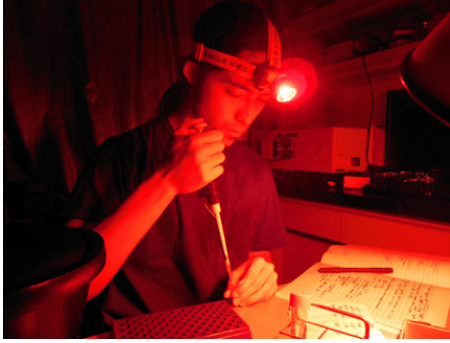
Student's Research Adventure - 2012

Kenneth Olson - Yellow Proteins in a Green Country



It was a bit like coming home, but I was getting off a plane 6,000 miles from my hometown of Glendale, Arizona. I had been to Japan many times as a child, but this was the first time back in six years, and the first time ever that I would be working in a research lab there. The familiar cadence of Japanese over the intercom, the commuters power-walking through the train station, the high-density neighborhoods unlike the sprawling suburbs of Arizona - all of these things brought about a sense of nostalgia but also novelty. There was something entirely new waiting for me though: the research lab of [Dr. Mikio Kataoka](#) ^[1] at the **Nara Institute of Science and Technology**, or NAIST.

NAIST, in Ikoma, Nara, is a graduate school founded in 1991 as part of the [Keihanna Science City](#) ^[2], a loose collection of universities and research institutions. Located about 30 minutes from Nara, and an hour from Osaka and Kyoto, many of the students and faculty commuted to the campus, but I would be spending my ten weeks in the guest house on campus, instead commuting out to sightsee on the weekends.



As a representative of **Dr. John Kyndt**, I was sent to Japan to research chimeric photoactive yellow protein (PYP). Photoactive yellow protein is, as the name might suggest, a yellow protein which responds to light (specifically blue light). It has many functions, for example, in signaling bacteria to swim away from light, but the exact mechanism isn't known. To try to elucidate this, our lab prepared four chimeric PYPs, assembled from parts of *Halorhodospira halophila* PYP and *Rhodobacter capsulatus* PYP. *R. capsulatus* PYP has a faster photorecovery and different spectrum than the well-studied *H. halophila* PYP, but we wanted to investigate which part of the protein specifically was responsible for these characteristics.

The first half of my trip, I spent most of my time making and purifying my protein, during which I learned a new method grow PYP in *E. coli*. PYP contains a cofactor, *p*-coumaric acid (pCA), which is necessary for the protein to function. In Dr. Kyndt's lab, we used a plasmid containing the genes necessary for the *E. coli* to make pCA which allowed the bacteria to make fully-functional PYP. In the Kataoka lab, however, they used a reconstitution method, where PYP is first made without the cofactor, and then mixed with pCA. I then spent the second half of the trip analyzing the chimeric proteins, looking at how they recover in different solvent conditions, and I even got to try out flash photolysis, a sort of high-speed absorption spectroscopy.



Because of my proximity to the megalopolis of [Osaka](#) ^[3], the historical treasure box of Kyoto, and its older cousin Nara, I had the opportunity to explore a variety of places over the weekends. The region around Osaka, known as Kansai, is a vibrant and diverse mixture of new and old Japan, and is seen as a bit of a foil to the sprawling and businesslike Kanto region surrounding Tokyo (on a relative scale, of course). Osaka is known for its comedians, its outgoing inhabitants, and its unique food, including takoyaki, a ball-shaped snack made with batter containing a piece of octopus. I visited Osaka a few times, but found its non-grid-aligned streets confusing and once walked around the same station three times trying to orient myself.



My personal favorite was [Kyoto](#) ^[4], a city of more than 2,000 religious sites dating back as far as the 8th century. It's the sixth-largest city in Japan but still retains its historical heritage even as it continues to grow. My labmates were kind enough to take me out to the Gion Festival, an annual quasi-religious festival organized by the descendents of the old merchant families of Kyoto. Because I had only ever visited Japan in June, and because the festival season doesn't start until late July, this was the first time I had opportunity to experience the atmosphere of a matsuri, when the streets are closed to cars and vendors set up shop on every main and side street selling all manner of street food.

I'd like to thank Drs. John Kyndt and Carol Bender for the support and assistance throughout the application process and my trip, as well as researchers both in Tucson and in Ikoma. I would also like to recognize the funding provided by the NIH (MD001427) that made this wonderful trip possible. All in all, I had a great time in Japan, and I made it a point to tell my labmates to come visit Arizona, because after ten weeks surrounded by greenery, sometimes it's nice to see some dirt and a cactus.

[Undergraduate](#) ^[5]

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- [3] <http://www.japan-guide.com/e/e2157.html>
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