



Bright Ideas from Down Below

It started out like any other shopping trip. Sergey Lukyanov was in his local pet store buying supplies for his four freshwater and saltwater aquariums when he saw a rare prize: a bright red bubble-tip anemone.

Most customers would have appreciated the anemone for its outer beauty, but Lukyanov, a bioorganic chemist, was more interested in what it held inside.

“A gut feeling told me that this animal must contain a beautiful red fluorescent protein,” says Lukyanov, an HHMI international research scholar at the Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry in Moscow, Russia.

In the lab, scientists use these fluorescent flares as biological highlighters for visualizing proteins or genes within a cell or organism. The first fluorescent protein used in research, green fluorescent protein, came from the crystal jelly jellyfish. Other proteins have come from aquatic animals such as the mushroom-shaped sea pansy, which glows green or blue when disturbed.

In the late 1990s, Lukyanov discovered the first set of coral fluorescent proteins, adding yellow and red to the color range. HHMI investigator Roger Tsien of the University of California, San Diego, further modified Lukyanov’s red fluorescent protein to reduce its tendency to aggregate, and he created more colors in the red range.

However, Lukyanov wanted a brighter, deep red hue. For this color, his research team cruised the seas—from the Mediterranean and Red Sea to the Gulf of Mexico. Had he found his treasure closer to home in a Moscow pet store?

Maybe. Maybe not. The anemone was promised to another customer. Undeterred, Lukyanov haggled for two

hours with the store employee, who eventually went to the manager. When the manager recognized Lukyanov as a regular customer, he relented and let him buy the anemone.

Back in the laboratory, Lukyanov and his team isolated the red protein from the anemone and created an enhanced version called turbo red fluorescent protein (TurboRFP). It lit up brighter and faster than all other proteins they had created so far. They derived several subtypes of the protein as well, all bearing different deep-red tones.

Lukyanov’s postdoc, Ekaterina Merzlyak, who worked on the strenuous 6-month project that involved isolating, sequencing, and modifying the protein, received the honor of putting her name on one subtype. They dubbed it *Katushka*, a Russian child nickname for “Kate.”

With a whole rainbow of colors now available, Lukyanov concedes, “I think we can stop searching in new animals.”

As for the fate of the pet-store anemone—only part of one tentacle was needed to extract the protein. The animal currently resides in one of Lukyanov’s aquariums, at home with other anemones, coral polyps, and several marine fish.

—*Jacqueline Ruttimann*



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