Researchers win top prize in Nikon International Small World imaging contest

October 1 2018, by Courtni Kopietz

Henry He, a researcher at the Morgridge Institute for Research and doctoral student in the Dresden International Ph.D. Program, Germany, and Liz Haynes, a postdoctoral fellow in the Department of Integrative Biology at UW-Madison, won first place in the 2018 Nikon Small World in Motion Competition for a video depicting neural development in a zebrafish embryo.

"The Nikon Small World Competition is an intersection of a scientific competition and artistic competition," He says. "It doesn't judge things solely on aesthetic value or solely on the scientific merit. This is imagery we take for our research project that just happens to be beautiful, in our opinion."

The Nikon competition judges agreed, awarding He and Haynes the top prize in the video category of the contest which is now in its eighth year. The clip features tendrils of neurons branching and migrating across the zebrafish embryo as it develops over time. The video was created from images taken every minute over a 16-hour time period using a home-built light sheet microscope.

He works at Morgridge in the lab of Jan Huisken, a pioneer in light sheet microscopy and UW-Madison visiting professor of integrative biology, and brings imaging expertise to the project. Haynes is the biologist on the team, working in the lab of UW-Madison neuroscientist Mary Halloran. The collaboration began when the Halloran Lab was looking for ways to image zebrafish neurodevelopment in a more dynamic

fashion, capturing all of the details and intricacies of development with respect to time.

Light sheet technology provides an image resolution similar to competing techniques like confocal microscopy, but light sheet is faster while also being gentler on the living sample, allowing for more images and healthier specimens.

"Before, we were imaging single cells. With light sheet we were able to get greater speed, as well as the ability to see the entire embryo at once," Haynes says. "My view of zebrafish had previously been just individual neurons growing. To now see them developing in concert across the entire embryo really added another dimension to what we were studying in neurodevelopment."

Haynes' work in the Halloran Lab aims to understand how axons navigate the whole area of the embryo to find their targets and reach a specific endpoint. Axons in an embryo often travel very long distances, up to 10 thousand times the length of their cell body, to reach their targets and to perform their functions. Shedding light on how they achieve their goal, and the molecular players that guide them, can inform understanding of developmental biology.

"It's very easy to be amazed by the cool imagery, but the science part requires a lot more rigor than just a pretty picture," He says. "We have to do multiple repeats to verify again and again that what we're seeing is a legitimate phenomenon, not an artifact of the mounting or the imaging."

The next step Haynes and He are working toward is developing a mid-throughput system to image more specimens at one time. The microscope is currently the bottleneck; while Haynes can procure many embryos at once, the current system still only allows for imaging one embryo at a time. The goal is to build a system that could image up to 25

embryos at once.

Both Haynes and He are looking forward to the continued collaboration.

"I think that this is the best collaboration I've ever been a part of," Haynes says. "The intellectual ideas are really fulfilling for me, because Henry really knows what's new and cutting edge in his field. It's not as common for someone to be in that middle space where they're really interested in microscopy and technique development as well as the biology."

"Through this collaboration, we're both teaching each other a lot," He says. "I'm teaching Liz more about optics and photophysics, while she's teaching me more about the biology behind the project we're working on. It's great to have a knowledgeable, dedicated collaborator that you can depend on."

Provided by Morgridge Institute for Research