Scientists create winning microscopic images

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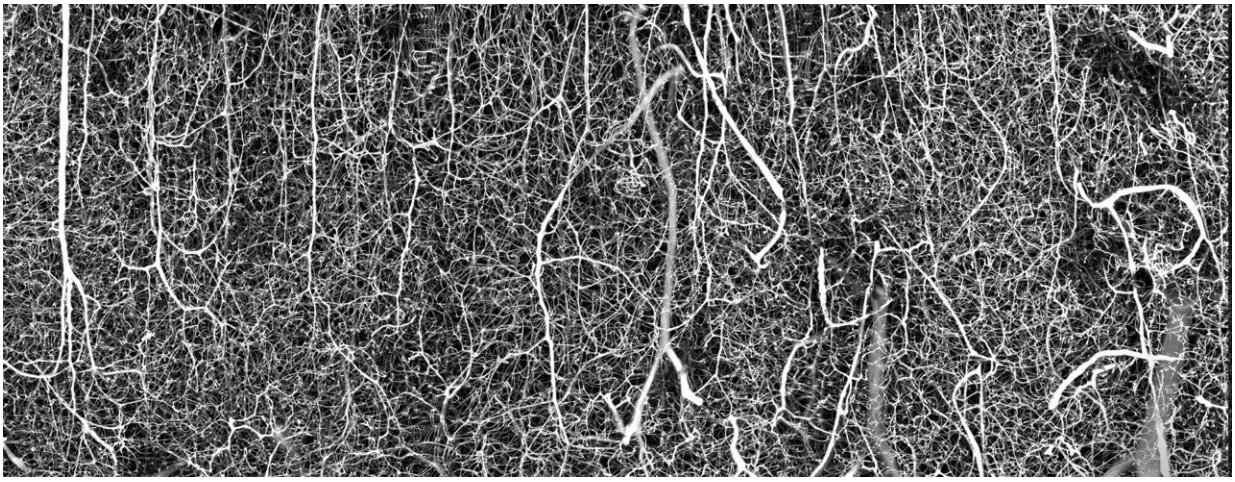


Sixth-place winning image of the entire network of blood vessels snaking through an adult mouse brain's sensory-motor cortex. Credit: Andrea Tedeschi

The natural world served as the inspiration for the Ohio State University scientists whose microscope images were announced Monday (Sept. 13) among the top 20 winners in the 2021 Nikon Small World Photomicrography Competition.

The competition was fierce: Almost 1,900 images from 88 countries were submitted for consideration.

Andrea Tedeschi, assistant professor of neuroscience, placed sixth in the annual contest with his image of the entire network of blood vessels

snaking through an adult mouse brain's sensory-motor cortex, an area involved in controlling sensory and motor integration.

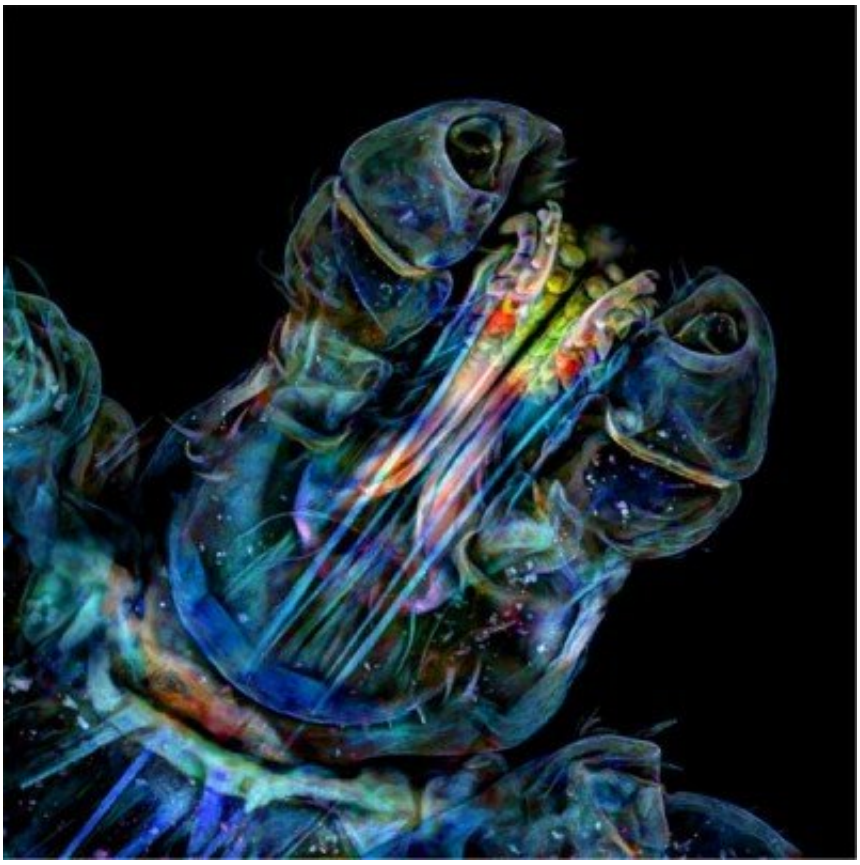
Tong Zhang and Paul Stoodley, associate director and director, respectively, of Ohio State's Campus Microscopy and Imaging Facility (CMIF), placed seventh in the competition with an up-close image of a tick's head that, thanks to an advanced color scheme, provides a detailed view of how the pest's mouth is structured.

"Nature is beautiful. That's a very important point to consider because we're studying something amazing. And that infuses us with a lot of positive energy," Tedeschi said. "Throughout my studies I became more and more interested in microscopy, not as a technique but as a tool to dive deeper into the unknown."

Tedeschi's lab focuses on understanding how stroke, spinal cord injury and brain trauma interfere with the structure and function of nerve cells and twisting blood vessels in the mouse central nervous system, hoping to make discoveries that influence clinical efforts to promote recovery.

He has perfected a technique that allows for visualization of every single blood vessel in the tiny mouse brain.

"Anything receiving a blood supply can be imaged under a microscope without losing any details of the fine structure of the vasculature, all the way to the capillaries—the fine and intricate last step of oxygen exchange in tissue," said Tedeschi, also a member of Ohio State's Chronic Brain Injury Discovery Theme.



Seventh-place image of a tick's head zeroing in on the anatomy of the mouth. Credit: Tong Zhang

Though neuroscientists tend to focus on the neural pathways in the brain and central nervous system, research on blood flow's impact on the development of neurodegenerative diseases is gaining steam. And being able to see just how intricate the vasculature is has led Tedeschi to dig more deeply into the link between blood supply and brain function.

"We tend to think neurons and neuronal circuits are the most complex structure, but in reality, if you superimpose the images, you can understand that brain vasculature is as complex as the neuron architecture," he said. "If you want to find where a disease is starting, you need access to the structure so you can understand the fine details

you might overlook."

The colorful tick head image created by Zhang and Stoodley was a sample slide, unrelated to any ongoing research. But the work has a direct connection to everyday professional life for the two, who manage operations of the core microscopy and imaging facility within Ohio State's Office of Research and Comprehensive Cancer Center. As senior microscopist, Zhang provides training, consultation and technical support to ensure that the facility's Ohio State, academic and industry users capture the best images possible for their projects.

Along with running CMIF, both are active researchers. Stoodley, a professor of microbial infection and immunity, focuses his research on identifying key processes in the development and persistence of biofilms, communities of bacteria living and communicating with each other, on the lab bench and in clinical and industrial settings. Zhang studies the dynamics between two cell components, the mitochondria that supply energy and the cytoskeleton networks that help cells maintain their shape, and how they relate to disease.

Blood-sucking ticks are common vectors of human and animals diseases, and Zhang set out to provide a detailed image zeroing in on the anatomy of the mouth—the structure ticks use to anchor themselves to the animals and humans serving as their blood meal sources.

He employed sample autofluorescence, the natural emission of light by biological structures, under different wavelengths, to produce a detailed and colorful visual of the tick head anatomy.

"The image was striking, and the autofluorescence color scheme made the mouth region pop up from the entire image," Zhang said. "You can see fine details in the tick's head, and especially its mouth region, with inverted arrow-like structures.

"It's a good example of nature's smart designs."

Both Tedeschi and Zhang noted that the Nikon Small World Photomicrography competition, now in its 47th year, has had an important role in showing the public how beautiful science can be.

"The images not only have scientific meaning, but also open a window to people, showing the fascinating small world," Zhang said.

Provided by The Ohio State University