Microscopy TODAY

Coming Events

Due to COVID-19, please check to see if the listed events have been postponed or canceled.

2022

72nd American Crystallographic Association (ACA) Annual Meeting
July 29–August 3, 2022
Portland, OR
acas.memberclicks.net/future-meetings

Microscopy & Microanalysis 2022
July 31–August 4, 2022
Portland, OR
www.microscopy.org/events/future.cfm

Imaging, Diffraction and Crystallography – Where John Spence's Legacy Leads Us
October 11–13, 2022
Tempe, AZ
phy.asu.edu/spencesymp

XVI CIASEM Congress: 16th Inter-American Congress on Microscopy
October 25–28, 2022
Oaxaca, Mexico and Virtual
ciasem2022.com

Neuroscience 2022
November 12–16, 2022
San Diego, CA
www.sfn.org/meetings/neuroscience-2022

2022 MRS Fall Meeting
November 27–December 2, 2022
Boston, MA
and
December 6–8, 2022
Virtual
mrs.org/meetings-events/fall-meetings-exhibits/2022-mrs-fall-meeting-exhibit

Cell Bio 2022
December 3–7, 2022
Washington, DC
www.ascb.org/cellbio2022

2023

Microscopy & Microanalysis 2023
July 24–28, 2023
Minneapolis, MN
www.microscopy.org/events/future.cfm

2024

Microscopy & Microanalysis 2024
July 28–August 1, 2024
Cleveland, OH
www.microscopy.org/events/future.cfm

Carmichael's Concise Review

Microscopy Reveals How a Lizard Can Lose its Tail

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Lizards can famously shed their tails when under threat from pursuing predators. The discarded tail, often wiggling, can distract the predator, allowing the lizard to survive the encounter. Self-amputation is known as autotomy and is a common defense strategy in lizards, salamanders, crustaceans, spiders, and other animals. This raises the important question of how does a lizard retain its tail during normal activities that

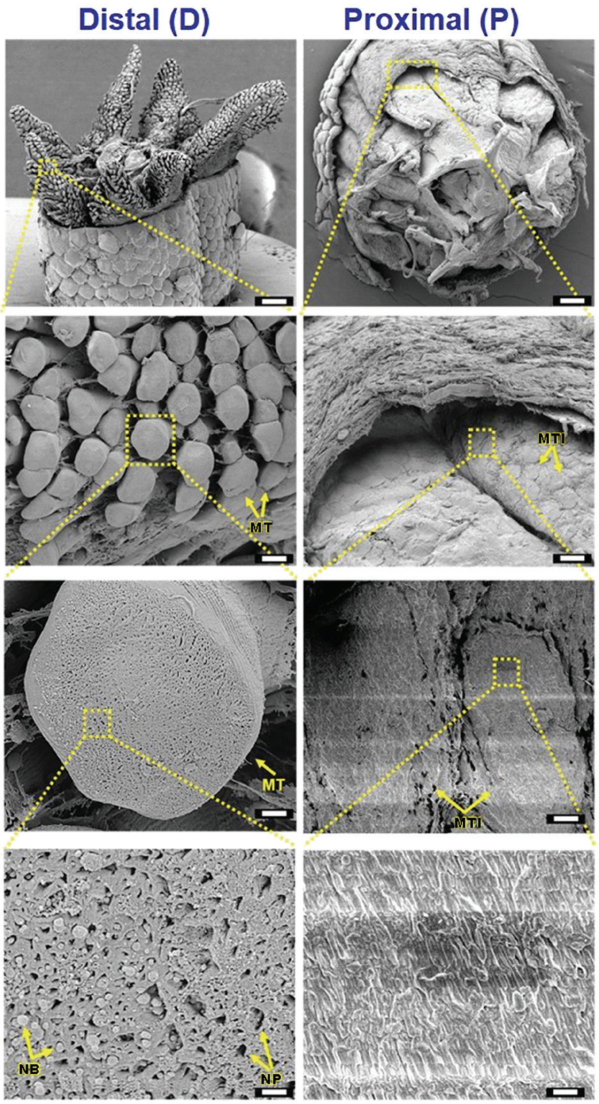

Figure 1: SEM of the distal (D) part showing wedge-shaped tissues with highly dense mushroom-shaped microstructures (scale bar = 1 mm). The enlarged portion shows the mushroom-shaped micropillared arrangement (scale bar = 100 μm) with the single mushroom top indicated as MT (scale bar = 10 μm) containing nanopores (NP) and nanobeads (NB) (scale bar = 1 μm). SEM of proximal (P) region (scale bar = 1 μm) shows the corresponding MT imprints indicated as MTI (scale bar = 100 μm). The single MTI (scale bar = 10 μm) shows a planar topology (scale bar = 1 μm).

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can be vigorous? The tail of a lizard affects its ability to run, leap, mate, and escape the next predator, so losing the tail is a costly sacrifice. The precise mechanism that provides the lizard with the advantage of retaining the tail in situations that are not life-threatening, yet readily shedding it when threatened, has recently been addressed in an elegant study by Navajit Baban, Yong-Ak Song, and others.

Baban et al. studied the tails of three common lizards, two species of geckos (*Hemidactylus flaviviridis* and *Cyrtopodion scabrum*, of the Gekkonidae family), and one from the family of "true" lizards (*Acanthodactylus schmidti*, of the Lacertidae family). In the laboratory the tail of the live animal was passively autotomized, and the event was captured by high-speed (3,000 frames per second) video. The proximal and distal exposed surfaces of the tail (the fracture plane) were immediately preserved in formalin and prepared for scanning electron microscopy (SEM). There are several potential facture planes in the tail, allowing for portions of the tail to be sacrificed, depending on the need. This is made possible by the fact that the lizard tail is not one entity, but assemblies of segments connected via the fracture planes.

The micrographs reveal assemblies analogous to "plugs-and-sockets." The distal part contains eight circumferentially arranged wedge-shaped muscle bundles representing the "plugs," and the proximal part encloses complementary grooves or pockets representing the "sockets." Closer examination of the distal part showed tightly packed micropillars of muscle with dilated ends so that they resembled mushrooms. The surface of the mushrooms had many nanopores and a few nanobeads. The magnified view of the complementary pockets showed imprints of the tops of the mushroom-shaped pillars. These surface imprints implied that the mushroom tops did not penetrate the proximal pockets, which would have resulted in a stronger connection. Instead, the lizard has adopted a different strategy for tail attachment, with many microscale and nanoscale points of contact that create a firm, but not rigid, attachment.

To explore the role of the nanopore-covered micropillars, Baban et al. built a biomimetic model of polydimethylsiloxane, a rubbery, flesh-like material. They performed mechanical tests on their model and correlated the results with the high-speed video of tail autotomy. They found that the spaces between micropillars, as well as other voids, slowed the spread of an initial fracture.

These and several other studies lead Baban et al. to hypothesize that contraction of skeletal muscle fibers (which are under voluntary control) would provide favorable autotomy conditions. As they state it, the tail remains sturdily and faithfully connected to the body, quickly detaching only when the lizard wills it. It is tempting to speculate that autotomy of the lizard tail is a voluntary survival response.

References

[1] NS Baban et al., *Science* 375 (2022) https://doi.org/10.1126/science.abh1614.
[2] The author gratefully acknowledges Drs. Navajit Baban and Yong-Ak (Rafael) Song for reviewing this article.