# New three-dimensional imaging and visualization technique provides detailed views of muscle architecture

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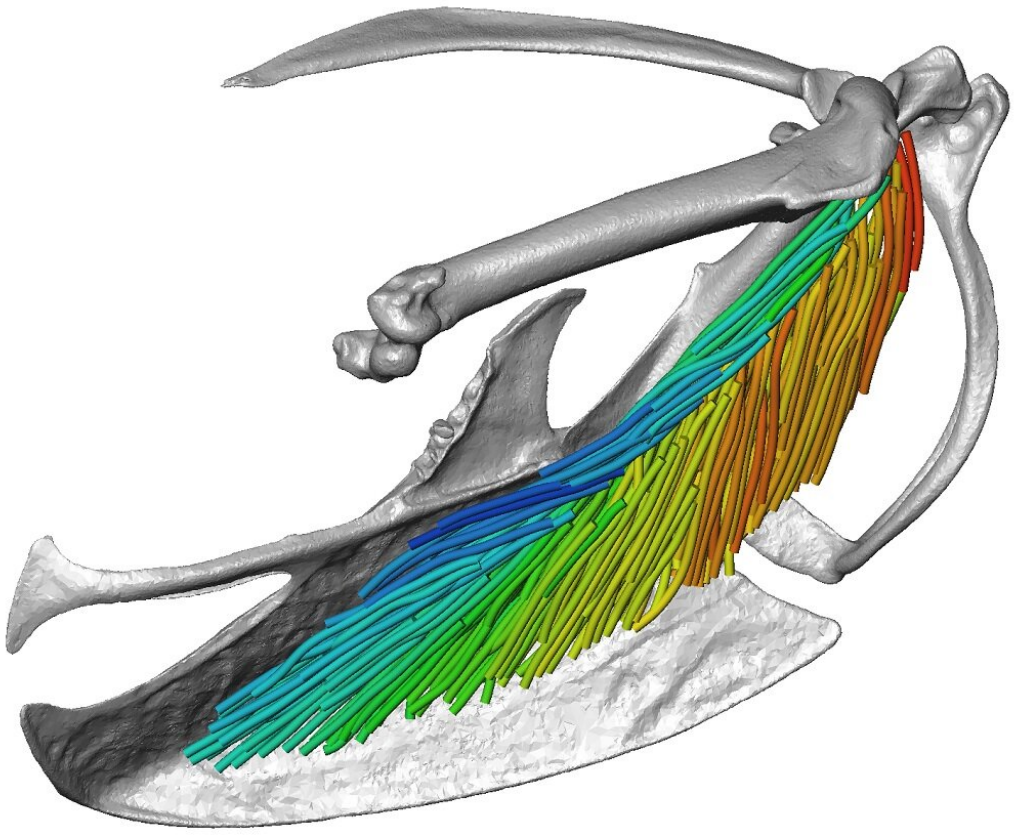

In a new study, scientists in pathology and anatomical sciences in the University of Missouri's School of Medicine have revealed a three-dimensional view of the skeletal muscles responsible for flight in a European starling. The study will form the basis of future research on the bird's wishbone, which is supported by these particular muscles and is hypothesized to bend during flight. Credit: University of Missouri

A new three-dimensional model of the skeletal muscles responsible for bird flight provides the most comprehensive and detailed picture of anatomy to date.

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"A lot of people have looked at this on a larger scale, but not in the detail we acquired," said Spiro Sullivan, a doctoral student in the MU School of Medicine and lead researcher on the study. "It's an unprecedented look into an especially tiny animal that bridges the gap between microscopic and large-scale muscle function."

The researchers used MU's new Xradia X-ray Microscope to collect the data and create a three-dimensional model of the bird's muscle fibers.

"We're using a mixture of enhanced CT imaging scans in combination with this new visualization technique of 3-D muscle fiber architecture," said Casey Holliday, an associate professor in the MU School of Medicine. "It's one of the first biological uses of this particular microscope, which can help us see inside animals in ways we could never before. This 3-D model can be displayed virtually on phones or with virtual reality goggles, or through a printed 3-D model."

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Researchers say this new technology can support various fields such as health sciences, medical education, research in biomechanics, paleontology, evolutionary biology and public education.

"This new technology is a great teaching tool on how humans and animals work at any educational level," said Kevin Middleton, an associate professor in the MU School of Medicine. "We already had a

pretty good understanding of muscles on a broader level but until now we didn't have a good way to see where the basic function of a muscle is happening."

Faye McGechie, a doctoral student and Life Sciences Fellow at MU, co-authored the study and is applying this technology to understanding human evolution.

"Many primates are endangered, and they have muscles that we have not been able to visualize yet because they are either too small or understudied," McGechie said.

**More information:** S P Sullivan et al, 3D Muscle Architecture of the Pectoral Muscles of European Starling (Sturnus vulgaris), *Integrative Organismal Biology* (2019). DOI: 10.1093/iob/oby010

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