Dr. Isaac Pratt & Dr. David Cooper
University of Saskatchewan
Email: isaac.pratt@usask.ca
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Three-Dimensional Orientation of Vascular Canals and Cross-Sectional Geometry of Cortical Bone in Birds and Bats

Cortical bone porosity and specifically the orientation of vascular canals is an area of growing interest in biomedical research and comparative/paleontological anatomy.

In this study we examined the vascular canal network in the humerus and femur of a sample of 31 bird and 24 bat species using synchrotron micro-computed tomography (micro-CT) to look for a connection between canal orientation and functional loading.

We found that bat cortices are relatively thicker and poorly vascularized, whereas those of birds are thinner and more highly vascularized, and that according to our cross-sectional geometric parameters, bird bones have a greater resistance to torsional stress than the bats; in particular, the humerus in birds is more adapted to resist torsional stresses than the femur.

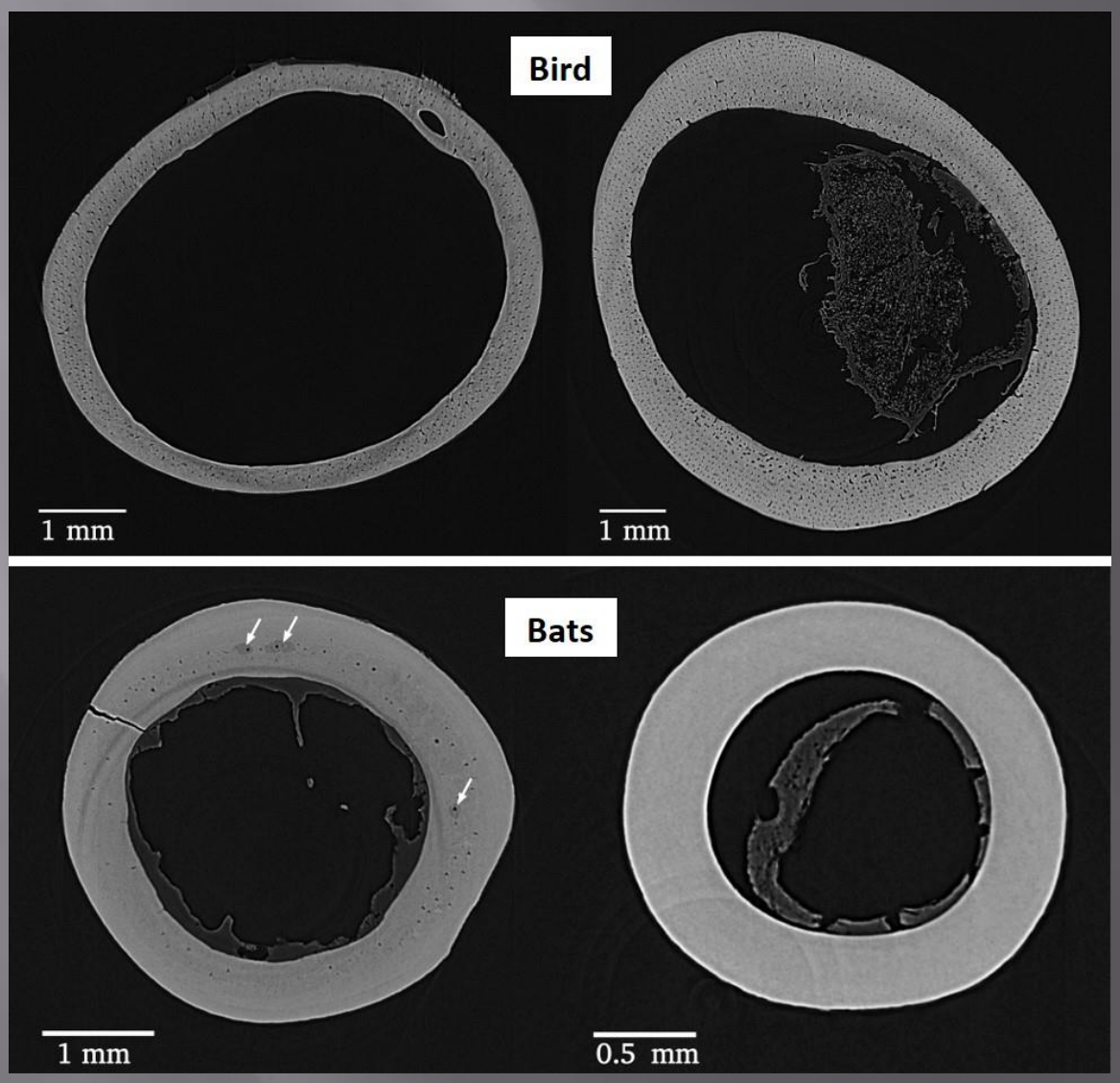

Figure. Above panel (birds): Both images show relatively thin cortices with full vascularization. Right, Swainson's hawk humerus; left, Snowy owl humerus. Below panel (bats): Note the relatively thick cortices with typical low vascularization. Complete absence of vascularization can be seen in the right cortex. Some evidence of secondary remodelling can be seen in the cortex on the left (white arrows). Right, Grey-headed flying fox femur; left, Spectral bat femur.