Songbird sings in 3D

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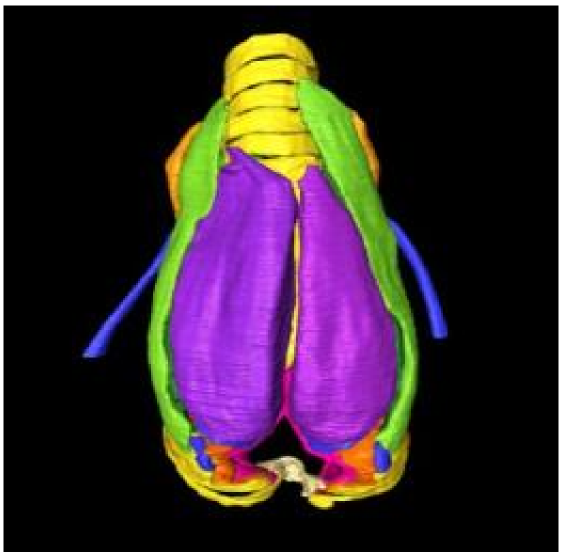

High-field magnetic resonance imaging and micro-computed tomography have been used to construct stunning high resolution, 3D, images, as well as a data set "morphome" of the zebra finch (*Taeniopygia guttata*) vocal organ, the syrinx. Credit: Daniel N Düring, Alexander Ziegler, Christopher K Thompson, Andreas Ziegler, Cornelius Faber, Johannes Müller, Constance Scharff and Coen P H Elemans.

The question 'How do songbirds sing?' is addressed in a study published in BioMed Central's open access journal *BMC Biology*. High-field magnetic resonance imaging and micro-computed tomography have been used to construct stunning high resolution, 3D, images, as well as a data set "morphome" of the zebra finch (*Taeniopygia guttata*) vocal organ, the syrinx.

Like humans, songbirds learn their vocalizations by imitation. Since their songs are used for finding a mate and retaining territories, birdsong is very important for reproductive success.

The syrinx, located at the point where the trachea splits in two to send air to the lungs, is unique to birds and performs the same function as vocal cords in humans. Birds can have such a complete control over the syrinx, with sub-millisecond precision, that in some cases they are even able to mimic human speech.

Despite great inroads in uncovering the neural control of birdsong, the anatomy of the complex physical structures that generate sound have been less well understood.

The multinational team has generated interactive 3D PDF models of the syringeal skeleton, soft tissues, cartilaginous pads, and muscles affecting sound production. These models show in detail the delicate balance between strength, and lightness of bones and cartilage required to support and alter the vibrating membranes of the syrinx at superfast speeds.

Dr Coen Elemans, from the University of Southern Denmark, who led this study, explained, "This study provides the basis to analyze the micromechanics, and exact neural and muscular control of the syrinx. For example, we describe a cartilaginous structure which may allow the zebra finch to precisely control its songs by uncoupling sound frequency and volume." In addition, the researchers found a previously unrecognized Y-shaped structure on the sternum which corresponds to the shape of the syrinx and could help stabilize sound production.

More information: The songbird syrinx morphome: a three-dimensional, high-resolution, interactive morphological map of the zebra finch vocal organ , Daniel N Düring, Alexander Ziegler, Christopher K

Thompson, Andreas Ziegler, Cornelius Faber, Johannes Müller, Constance Scharff and Coen P H Elemans, *BMC Biology* (in press)

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