Coming Events

2012

Inter/Micro – Applied Microscopy
July 9–13, 2012
Chicago, IL
http://mcri.org/home/section/101/inter-micro

Microscopy & Microanalysis 2012
July 29–August 2, 2012
Phoenix, AZ
www.microscopy.org

Denver X-ray Conference
August 6–10, 2012
Denver, CO
www.dxcicdd.com

European Microscopy Congress
September 16–21, 2012
Manchester, UK
www.emc2012.org.uk
Abstract deadline: March 16, 2012

MS&T 2012
October 7–11, 2012
Pittsburg, PA
www.matscitech.org

Neuroscience 2012
October 13–17, 2012
New Orleans, LA
www.sfn.org

2012 MRS Fall Meeting
November 26–30, 2012
Boston, MA
www.mrs.org/fall2012

ASCB Annual Meeting
December 15–19, 2012
San Francisco, CA
www.ascb.org

2013

Microscopy & Microanalysis 2013
August 4–8, 2013
Indianapolis, IN
www.microscopy.org

2014

Microscopy & Microanalysis 2014
August 3–7, 2014
Hartford, CT
www.microscopy.org

2015

Microscopy & Microanalysis 2015
August 2–6, 2015
Portland, OR
www.microscopy.org

2016

Microscopy & Microanalysis 2016
July 24–28, 2016
Columbus, OH
www.microscopy.org

More Meetings and Courses
Check the complete calendar near the back of this magazine and in the MSA journal *Microscopy and Microanalysis*.

Carmichael's Concise Review

Microscopy Reveals the Chirping of a Jurassic Katydid!

Stephen W. Carmichael
Mayo Clinic, Rochester, MN 55905

carmichael.stephen@mayo.edu

Perhaps you've never wondered what sounds permeated the nighttime in a Jurassic forest, but there is now a partial answer. With the good fortune to obtain a well-preserved fossil specimen, Jun-Jie Gu, Fernando Montealegre-Z, Daniel Robert, Michael Engel, Ge-Xia Qiao, and Dong Ren were able to reconstruct the sounds that would have been made by a katydid of that geologic time [1].

Katydids produce "songs" that are specific to each species by rubbing a toothed vein on one wing against a structure (the plectrum) on the other wing. This produces a sound by a process called stridulation, which is essentially a ratcheting motion that occurs at an audible frequency. In this case, this is a biophysical mechanism that results in a resonant (musical) or non-resonant (broadband) sound that varies with the species. Which of these sounds was developed first is a key question in the evolution of insects' acoustic communication.

The specimen was collected from a formation in Inner Mongolia (China) that dates to the Middle Jurassic period, about 165 million years ago. Importantly, the specimen was found among other fossils that established the site as a forest of coniferous trees and giant ferns. Such a forest would be expected to contain reptiles, amphibians, and mammalian insectivores that could have heard the song of this katydid. Gu et al. named this specimen *Archaboilus musicus*, referring to the extinct family Haglidae, a group thought to precede all extant katydids, and *musicus*, derived from the fact that this insect was equipped to make tonal calls.

Using scanning electron microscopy to examine extant species and ultra-high resolution light microscopy to examine *A. musicus* (Figure 1), Gu et al. found that *A. musicus* had veins of nearly identical dimensions on both wings (which were large, about 72 mm long) and identical stridulatory files with exceptionally well-preserved and elaborate cuticular teeth. They concluded that this insect had bilaterally symmetric wings. This is significant because most extant katydids exhibit asymmetric wings and make their call by overlapping the left wing over the right (producing either musical or broadband calls), whereas a few others have symmetrical wings that allow swapping wing overlap and produce only

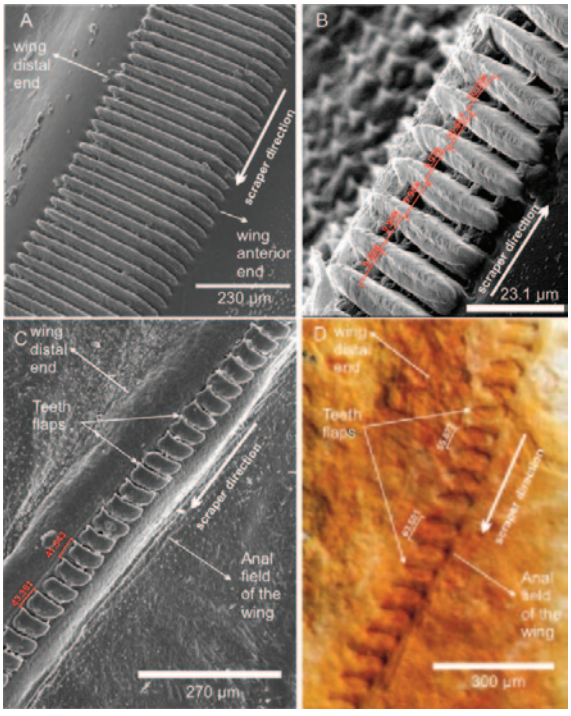


Figure 1: SEM images of three extant katydids and a light microscope image of a fossil of a Jurassic period katydid ancestor (lower right). The tooth patterns in each case are used in the production of characteristic katydid "songs."

https://doi.org/10.1017/S1551929512000417 Published online by Cambridge University Press

doi:10.1017/S1551929512000417

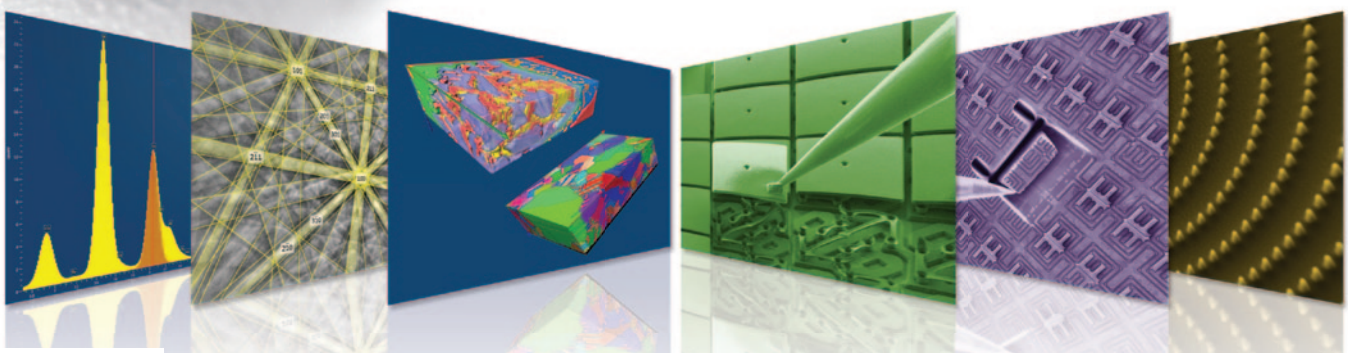
Oxford Instruments and Omniprobe are now ONE

Nanotechnology Tools for the SEM, TEM & FIB

Omniprobe is now part of Oxford Instruments NanoAnalysis.

Together, we'll be creating a new and exciting platform of tools for the electron and ion-beam microscopes. We'll provide better support, broader application experience and more integrated solutions.

You can rely on real innovation from Oxford Instruments – it's what we do. Our goal is to take nanotechnology to a completely new dimension.



Email: nanoanalysis@oxinst.com

www.oxford-instruments.com/nanoanalysis

OXFORD INSTRUMENTS

The Business of Science®

musical calls. The evidence strongly suggests that *A. musicus* is more closely related to the latter group.

Using innovative comparative analysis and current knowledge of the biomechanics of wing stridulation of extant species, Gu et al. reconstructed the main properties of the acoustic signals of these ancient insects. It is remarkable that they reproduced the sound of what they concluded this long-extinct katydid sounded like. Furthermore, they included an image of what the Jurassic forest may have looked like when this chirping occurred. The image and sound can be accessed at: www.pnas.org/content/suppl/2012/02/03/1118372109.DCSupplemental/sm01.mov

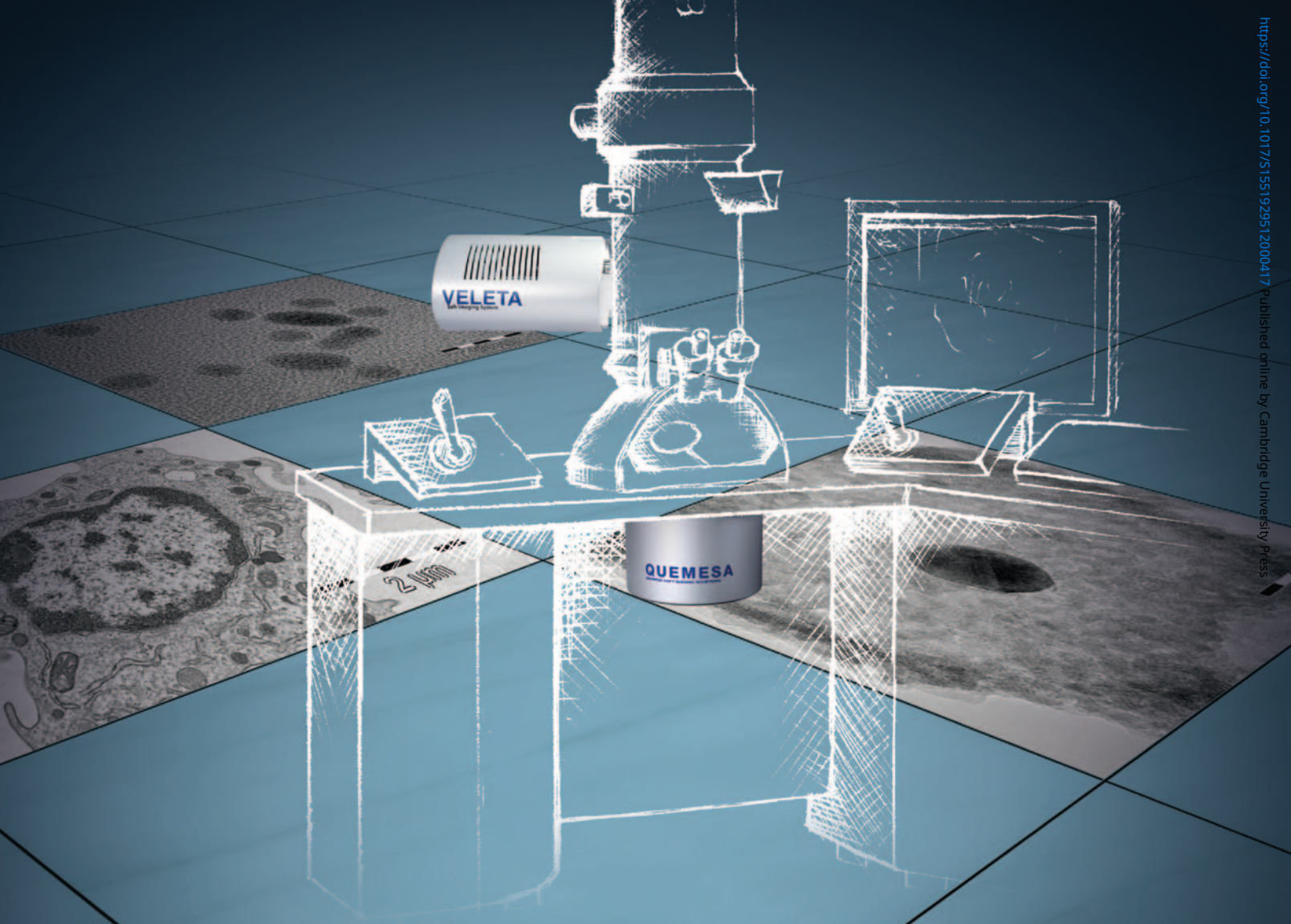
The main purpose of katydid songs is to attract mates, yet attempting to avoid predators. Bats are an example of predators that use the acoustic signal of an insect for predation, but interestingly, bats appeared after the Jurassic period, nearly 100 million years after the time of *A. musicus*. Contrary to previous scenarios, Gu et al. appear to have established that musical songs evolved early, preceding the broad-bandwidth songs of extant katydids.

References

[1] JJ Gu, F Montealegre-Z, D Robert, MS Engel, GX Qiao, and D Ren, *Proc Nat Acad Sci* 109 (2012) 3868–73.

[2] The author gratefully acknowledges Drs. Fernando Montealegre-Z and Dong Ren for reviewing this article.

MT



Aligned with your application on any TEM

TEM camera systems for Life and Materials Sciences

Multiple TEMs and TEM cameras are available to contend with the many diverse and demanding tasks in today's life and materials science. Only when the TEM and camera system are paired correctly you will be able to easily complete your tasks and overcome your challenges.
All of our side-mounted and bottom-mounted TEM cameras can be easily attached to virtually any TEM. The camera itself, and also most remote-controlled TEMs and stages, can be operated via iTEM – our TEM imaging platform. With these well aligned TEM image acquisition solutions, your TEM work flow can become the most efficient work flow possible.

For further **information**: info.osis@olympus-sis.com,
www.soft-imaging.net

Visit us at the
M&M 2012
Booth 528

Visit us at the
EMC 2012
Booth 712

OLYMPUS
Your Vision, Our Future