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Simple Rubber Device Mimics Complex Bird Songs

Stretched Tube Designed by Harvard Researchers Mimics Zebra Finch Songs
Presentation at Fluid Dynamics Meeting Today in Long Beach, CA

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EMBARGOED for release until 12:30 p.m. Eastern time (U.S.) on Sunday, Nov. 21, 2010

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WASHINGTON, D.C., November 21, 2010 -- For centuries, hunters have imitated their avian prey by whistling through their fingers or by carving wooden bird calls. Now a team of physicists at Harvard University in Cambridge, Massachusetts, has reproduced many of the characteristics of real bird song with a simple physical model made of a rubber tube.

"We wanted to know if you [could] build a simple device, which has minimal control but reproduces some non-trivial aspects of bird song," says L Mahadevan, a professor at Harvard. The work is being presented today at the American Physical Society Division of Fluid Dynamics meeting in Long Beach, CA.

Bird song -- a complex sound full of intricate patterns and rich harmonics -- has long been studied by neuroscientists. Their research has explained much about how young birds learn these songs from adults and the complex neurological changes that allow them to control their voices.

But Aryesh Mukherjee, a graduate student in Mahadevan's laboratory, suggests that this neural control need not be as complicated as it could be. He suspects that the physics of a bird's vocal tract could explain much of the complexity of its voice, even with relatively simple neural control.

His bird call device consists of an air source, which creates a flow through a stretched rubber tube (modeled after a bird's vocal tract), and a linear motor that presses on the tube in a fashion analogous to a contracting muscle.

"Using this very simple device that pokes a tube, I see these beautiful sounds being produced without a sophisticated controller," says Mukherjee.

When analyzed on a spectrogram, the harmonics and other characteristics of the sounds made by the physical model closely resemble the songs of a zebra finch.

Another researcher in the lab, Shreyas Mandre, now an assistant professor at Brown University, is building mathematical models that seek to capture some of the underlying principles. His model, which represents the voice as a stretched string with dampened vibrations, creates digital bird calls that are also very similar to the real thing.

"Once we understand the physics better, we'll be able to mimic the sound much better," says Mandre.

The principles underlying the models aren't limited to single species of birds. The researchers believe that -- with a few tweaks -- their models could mimic a variety of bird calls.

The presentation, "Bird song: in vivo, in vitro, in silico" is at 9:18 a.m. on Sunday, November 21, 2010 in the Long Beach Convention Center Room: 202A. ABSTRACT: http://meetings.aps.org/Meeting/DFD10/Event/132278

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MORE MEETING INFORMATION

The 63rd Annual DFD Meeting is hosted this year by the University of Southern California, California State University Long Beach, California Institute of Technology, and the University of California, Los Angeles.

It will be held at the Long Beach Convention Center, located in downtown Long Beach, California. All meeting information, including directions to the Convention Center is at: http://www.dfd2010.caltech.edu/

USEFUL LINKS

Main meeting Web site: http://www.dfd2010.caltech.edu/
Search Abstracts: http://meetings.aps.org/Meeting/DFD10/SearchAbstract
Directions to Convention Center: http://www.longbeachcc.com/

PRESS REGISTRATION

Credentialed full-time journalist and professional freelance journalists working on assignment for major publications or media outlets are invited to attend the conference free of charge. If you are a reporter and would like to attend, please contact Jason Bardi (jbardi@aip.org, 301-209-3091).

ONSITE WORKSPACE FOR REPORTERS

A reserved workspace with wireless internet connections will be available for use by reporters in the Promenade Ballroom of the Long Beach Convention Center on Sunday, Nov. 21 and Monday, Nov. 22 from 8:00 a.m. to 5:00 p.m. and on Tuesday, Nov. 23 from 8:00 a.m. to noon. Press announcements and other news will be available in the Virtual Press Room (see below).

VIRTUAL PRESS ROOM
The APS Division of Fluid Dynamics Virtual Press Room will be launched in mid-November and will contain dozens of story tips on some of the most interesting results at the meeting as well as stunning graphics and videos. The Virtual Press Room will serve as starting points for journalists who are interested in covering the meeting but cannot attend in person. See: http://www.aps.org/units/dfd/pressroom/index.cfm

GALLERY OF FLUID MOTION
Every year, the APS Division of Fluid Dynamics hosts posters and videos that show stunning images and graphics from either computational or experimental studies of flow phenomena. The outstanding entries, selected by a panel of referees for artistic content, originality and ability to convey information, will be honored during the meeting, placed on display at the Annual APS Meeting in March of 2011, and will appear in the annual Gallery of Fluid Motion article in the September 2011 issue of the American Institute of Physics' journal, Physics of Fluids.

This year, selected entries from the 28th Annual Gallery of Fluid Motion will be hosted as part of the Fluid Dynamics Virtual Press Room. In mid-November, when the Virtual Press Room is launched, another announcement will be sent out.

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ABOUT THE APS DIVISION OF FLUID DYNAMICS
The Division of Fluid Dynamics of the American Physical Society (APS) exists for the advancement and diffusion of knowledge of the physics of fluids with special emphasis on the dynamical theories of the liquid, plastic and gaseous states of matter under all conditions of temperature and pressure. See: http://www.aps.org/units/dfd/

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