



American  
Physical  
Society

One Physics Ellipse  
College Park, MD 20740-3844  
[www.aps.org](http://www.aps.org)

For Immediate Release:  
Nov. 18, 2011

Contact: Charles E. Blue  
(301) 209-3091

### **How Mosquitoes Fly in the Rain**

Mosquitoes, which thrive in hot, humid climates, are as adept at flying in rainstorms as under clear skies. That's puzzling: Why aren't the bugs – which each weigh 50 times less than a raindrop – battered and grounded by those falling drops?

In fact, say David Hu, an assistant professor of mechanical engineering and biology at the Georgia Institute of Technology, and his graduate research assistant Andrew Dickerson, mosquitoes *are* hit by raindrops. Hu, Dickerson, and colleagues measured the impact forces of drops on both free-flying mosquitoes and custom-built mosquito "mimics" (small Styrofoam spheres of mosquito-like size and mass), and captured the interactions using high-speed video.

The researchers found that because the bugs fly so slowly (a maximum of 1 meter per second) compared to the drops (which fall at velocities ranging from 5 to 9 meters per second), "they cannot react quickly enough for avoidance, and likely cannot sense the oncoming collision anyway," Dickerson says. But, he adds, "under low-wind conditions, the insects fly slowly enough that frontal impacts are infrequent, similar to us running in the rain. Instead, transverse impacts on the body and wings dominate."

The mosquitoes' low mass and speed – and thus low inertia – means that the raindrops are largely unaffected by the collisions. Thus, the drops don't splash *on* the bugs. "The most probable impact is one that rotates the mosquito instead of pushing it vertically downward," Hu says.

Indeed, Hu and company's video analysis shows that, after pushing past the mosquitoes, falling drops have lost very little speed. "Consider this analogy," Hu says: "A falling boulder hits a slowly falling human. The human, unless hit square-on, will be pushed aside quickly, and continue falling at a speed similar to pre-impact. Should the same boulder hit the earth, the boulder will break into many pieces."

Hu discusses the findings and their implications for the development of flapping micro-aircraft in a talk at the *APS Division of Fluid Dynamics Meeting*, which will take place Nov. 20-22, 2011, at the Baltimore Convention Center in the historic waterfront district of Baltimore, Maryland.

The talk, "How mosquitoes fly in the rain," is at 2:10 pm on Sunday, Nov. 20, in Room 309.

Abstract: [http://absimage.aps.org/image/MWS\\_DFD11-2011-001064.pdf](http://absimage.aps.org/image/MWS_DFD11-2011-001064.pdf)

# # #

### **MORE MEETING INFORMATION**

The 64th Annual DFD Meeting is hosted by the Johns Hopkins University, the University of Maryland, the University of Delaware and the George Washington University. Howard University and the U.S. Naval Academy are also participating in the organization of the meeting. It will be held at the Baltimore Convention Center, located in downtown Baltimore, Md. All meeting information, including directions to the Convention Center, is at:

<http://www.dfd2011.jhu.edu/index.html>

### **USEFUL LINKS**

Main Meeting Web Site: <http://www.dfd2011.jhu.edu/index.html>

Search Abstracts: <http://meeting.aps.org/Meeting/DFD11/Content/2194>

Directions and Maps: <http://www.dfd2011.jhu.edu/venuemaps.html>

### **PRESS REGISTRATION**

Credentialed full-time journalists 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 Charles Blue ([cblue@aip.org](mailto:cblue@aip.org), 301-209-3091).

### **SUPPORT DESK FOR REPORTERS**

A media-support desk will be located in the exhibit area. 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 features news releases, graphics, videos, and other information to aid in covering the meeting on site and remotely. See:

<http://www.aps.org/units/dfd/pressroom/index.cfm>