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Jump Rope Aerodynamics

Princeton Researchers use Robotics and High-Speed Cameras to Examine Engineering Principles Behind Common Game

Presentation at Fluid Dynamics Meeting Today in Long Beach, CA

EMBARGOED for release until 5:30 p.m. Eastern time (U.S.) on Sunday, Nov. 21, 2010

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WASHINGTON, D.C., November 21, 2010 -- Jump ropes are used by kids for fun and by athletes for training. But what about the underlying physics? How do jump ropes work? Can important engineering principles be studied?

Jeff Aristoff and Howard Stone of Princeton University have built themselves a robotic jump rope device that controls all the rope parameters -- rope rotation rate, rope density, diameter, length, and the distance between "hands." They capture the motion of the ropes by high-speed cameras, one to the side and one at the end. Then they compare the observed behavior with predictions made by their equations -- work they are presenting today at the American Physical Society Division of Fluid Dynamics (DFD) meeting in Long Beach, CA.

"Our main discovery is how the air-induced drag affects the shape of the rope and the work necessary to rotate it," says Princeton researcher Jeff Aristoff. "Aerodynamic forces cause the rope to bend in such a way that the total drag is reduced." (Leaves do this too when they bend out of the wind.) This deflection or twisting is most important in the middle of the rope and the least at the ends. If the rope is too light it might not clear the body of the jumper.

"Implications for successful skipping will be discussed, and a demonstration is possible," said Aristoff about his presentation at the meeting. "Fluid dynamic effects on long flexible

filaments occur in both engineered structures and many natural systems, so insights from the jump rope will hopefully inform other common situations," he added.

The presentation, "The aerodynamics of jumping rope" is at 2:31 p.m. on Sunday, November 21, 2010 in the Hyatt Regency Long Beach Room: Regency D. ABSTRACT: <http://meetings.aps.org/Meeting/DFD10/Event/132630>

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.

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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