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**WATER, BLOOD, WIND, MOVIES, ROBOTS, and COFFEE RINGS**

*Highlights of APS Division of Fluid Dynamics Meeting,*

*Long Beach, CA, Nov. 21-23, 2010*

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FOR IMMEDIATE RELEASE

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WASHINGTON, D.C., November 3, 2010 -- Many of nature's most fascinating phenomena involve various forms of fluid flow, and scientists who study fluid dynamics investigate everything from the way that dogs shake off water to the formation of proto-planets and coffee rings, the mathematics of flowing blood, the spray from rolling tires, the blowing wind, and a wide range of other questions that impact applications from ship design to medical devices.

These topics and many others will be explored this month at the 63rd Annual Meeting of the American Physical Society's (APS) Division of Fluid Dynamics (DFD), which takes place from November 21-23, 2010 at the Long Beach Convention Center, located in downtown Long Beach, California. The DFD meeting is the largest scientific conference of its type, bringing together researchers from around the globe to present work in engineering, energy, astronomy, medicine, and more.

Reporters are invited to attend the conference free of charge. Registration instructions and other information may be found at the end of this news release.

**BRIEF HIGHLIGHTS OF SCIENTIFIC PROGRAM**

The following is a sampling of the 2,025 scientific presentations at the meeting:

- 1) Fluid Simulation in the Movies
- 2) How Fast do Wet Dogs Shake?
- 3) The Physics of Coffee Ring Formation
- 4) Using Bacteria to Generate Power
- 5) The Secrets of Blood-Sucking Mosquitoes
- 6) Simulated Wind Farms
- 7) Magnetic Medicine
- 8) Fractal Spoilers on Airplanes to Reduce Noise
- 9) The Secrets of Hovering Birds
- 10) The Physics of Forming Planets
- 11) Capillary Rafts and Armored Droplets

- 12) The Science of Tire Spray
- 13) Investigating Flow within Small Blood Vessels
- 14) The Mathematics of Writing With Ink
- 15) Why Leaves on Lakes Cluster
- 16) The Physics of Horizontal Axis Wind Turbines
- 17) Robots Walking on Sand
- 18) Evaporation Waves

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### **1) FLUID SIMULATION IN THE MOVIES**

The advent of powerful modern computers and their ability to simulate the motions of all types of fluids has had a special impact on art as well as science. In a special session on Sunday, November 21, invited speaker Jerry Tessendorf of Rhythm and Hues Studios will discuss fluid simulation in the movies -- a topic recognized in the 2008 Academy Awards for technical achievement, given to four visual effects companies.

The session, "Fluid Simulation in the Movies: Navier and Stokes Must Be Circulating in Their Graves" is at 3:30 p.m. on Sunday, November 21, 2010 in Grand Ballroom B of the Long Beach Convention Center. See:

<http://meetings.aps.org/Meeting/DFD10/Event/132657>

### **2) HOW FAST DO WET DOGS SHAKE?**

"We investigate experimentally the ability of hirsute animals to rapidly oscillate their bodies to shed water droplets, nature's analogy to the spin cycle of a washing machine."

<http://meetings.aps.org/Meeting/DFD10/Event/133712>

### **3) THE PHYSICS OF COFFEE RING FORMATION**

"Microscopic particles suspended in a liquid are transported and deposited at a contact line, as the contact line recedes due to evaporation. A particle layer of uniform thickness is deposited if the particle concentration is above a threshold; below this threshold the deposit forms periodic bands oriented parallel to the contact line. We present a model for the formation of these bands..."

<http://meetings.aps.org/Meeting/DFD10/Event/134397>

### **4) USING BACTERIA TO GENERATE POWER**

"In this study, we present electrical power generation by using swimming *Serratia marcescens* which is a rod shaped bacterium species and has about 10- $\mu$ m long and about 20-nm-thin helical filaments."

<http://meetings.aps.org/Meeting/DFD10/Event/134379>

### **5) THE SECRETS OF BLOOD-SUCKING MOSQUITOES**

"In this study, the dynamic motions of valve organs of blood-sucking female mosquitoes were observed under in vivo conditions using a synchrotron X-ray micro imaging technique. X-ray micro computed tomography was also employed to examine the three-dimensional internal structure of the blood pumping system including valve organs."

<http://meetings.aps.org/Meeting/DFD10/Event/132503>

### **6) SIMULATED WIND FARMS**

"Understanding the effects of atmospheric turbulence and terrain-specific flow phenomena on the aerodynamic performance of wind turbine rotors is a critical prerequisite for improving blade designs, developing effective flow control strategies and improving wind farm layouts."

<http://meetings.aps.org/Meeting/DFD10/Event/134043>

### **7) MAGNETIC MEDICINE**

"Magnetic nanoparticles can easily be administered to patients intravenously for use in therapies such as hyperthermia or localized drug delivery."

<http://meetings.aps.org/Meeting/DFD10/Event/133029>

### **8) FRACTAL SPOILERS ON AIRPLANES TO REDUCE NOISE**

One of the major environmental problems facing the aviation industry is that of aircraft noise. The work presented in this paper, done as part of the OPENAIR Project, looks at reducing spoiler noise through means of large-scale fractal porosity.

<http://meetings.aps.org/Meeting/DFD10/Event/133583>

### **9) THE SECRETS OF HOVERING BIRDS**

"We experimentally investigate how small birds attain a stabilized vision and body posture during hovering."

<http://meetings.aps.org/Meeting/DFD10/Event/133363>

### **10) THE PHYSICS OF FORMING PLANETS**

"It is a remarkable fact that planets start out as microscopic grains within the protoplanetary disks of gas and dust in orbit around newly formed protostars, somehow growing by a factor of  $10^{40}$  in mass in a period no more than  $10^7$  years." <http://meetings.aps.org/Meeting/DFD10/Event/132609>

### **11) CAPILLARY RAFTS AND ARMORED DROPLETS**

"Small objects trapped at an interface are very common in Nature (insects walking on water, ant rafts, bubbles or pollen at the water-air interface, membranes...) and are found in many multiphase industrial processes. The study of such particle-laden interfaces is therefore of practical as well as fundamental importance. Here we report experiments on the self-assembly of spherical particles into capillary rafts at an oil-water interface and elucidate how such rafts sink"

<http://meetings.aps.org/Meeting/DFD10/Event/133714>

### **12) THE SCIENCE OF TIRE SPRAY**

"A novel laboratory apparatus has been built to understand the mechanisms and statistics of droplet production for spray emerging from a rolling tire."

<http://meetings.aps.org/Meeting/DFD10/Event/133209>

### **13) INVESTIGATING FLOW WITHIN SMALL BLOOD VESSELS**

"Increases in systemic blood pressure (hypertension) resulting from pathologic changes in the resistance arterial response represent the primary risk factor for cardiovascular diseases. We use a microfluidic strategy to investigate small blood vessels by quantifying structural variations within the arterial wall, resistance artery outer contour and diameter over time."

<http://meetings.aps.org/Meeting/DFD10/Event/133633>

### **14) THE MATHEMATICS OF WRITING WITH INK**

"When one writes on the paper with a pen, the ink spreads on the porous hydrophilic solid surface leaving a trail whose width depends on the pen speed and the physicochemical properties of the ink and of the paper. Here we mathematically describe the spreading profile of the ink..."

<http://meetings.aps.org/Meeting/DFD10/Event/133142>

**15) WHY LEAVES ON LAKES CLUSTER**

"Clustering of matter on the surface of lakes and pools and of oil slicks and seaweed on the sea surface is well-known empirically but there is no theory that describes it."

<http://meetings.aps.org/Meeting/DFD10/Event/132396>

**16) THE PHYSICS OF HORIZONTAL AXIS WIND TURBINES**

"The detailed flow field measurements were correlated with the wind load measurements to elucidate the underlying physics associated with turbine power generation and fatigue loads acting on wind turbines."

<http://meetings.aps.org/Meeting/DFD10/Event/133625>

**17) ROBOTS WALKING ON SAND**

"When legged locomotors move on granular media their limbs intrude into the substrate along paths more complicated than simple vertical or horizontal trajectories."

<http://meetings.aps.org/Meeting/DFD10/Event/134360>

**18) EVAPORATION WAVES**

"A new experimental method is presented as well as some experimental results obtained by tracking the evolution of the [evaporation] front with a high speed camera. "

<http://meetings.aps.org/Meeting/DFD10/Event/134354>

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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](mailto: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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