



[About](#) | [Testimonial](#) | [Jobs](#) | [Store](#) | [FASEB Directory](#)

 Search

Support APS

[Awards](#) | [Careers](#) | [Education](#) | [Meetings](#) | [Membership](#) | [Publications](#) | [Science Policy](#)

## » Harvard Researcher Receives APS's Walter B. Cannon Award



[home](#) / [hp](#) / [audiences](#) / [public](#) / [press](#) / [archive](#) / [2010](#) / [harvard researcher: cannon award](#)

Login

### The American Physiological Society Press Release

#### In this section

[2012 Press Releases](#)  
[2011 Press Releases](#)  
[2010 Press Releases](#)  
[2009 Press Releases](#)  
[2008 Press Releases](#)  
[2007 Press Releases](#)

#### Information For...

[Advertising / Marketing](#)  
[Advocacy and Outreach](#)  
[Authors](#)  
[Chapters](#)  
[Committees](#)  
[Early Career Professionals](#)  
[Graduate/Professional Students](#)  
[Groups](#)  
[K-12 Education](#)  
[Minority Scientists](#)  
[Postdoctoral Fellows](#)  
[Public / Press](#)  
[Sections](#)  
[Subscription Information](#)

**APS Contact:** Donna Krupa

**Email:** [dkrupa@the-aps.org](mailto:dkrupa@the-aps.org)

**Phone:** 301.634.7209

**Twitter:** [@Phyziotchick](#)



## Harvard Professor Of Bioengineering And Physiology Earns Walter B. Cannon Award From The American Physiological Society

### Jeffrey Fredberg's Cannon Lecture Looks at "A Hard Day in the Life of a Soft Cell"

**ANAHEIM, CA** - When Harvard University Professor of Bioengineering and Physiology Jeffrey J. Fredberg, PhD, set out to learn how the cells lining human airways behave during an asthma attack, he never anticipated that what he discovered would challenge long-held beliefs about cell structure and lead to a new theory about a critical step in evolution.

Dr. Fredberg and his team developed nanotechnologies for probing the mechanical properties of cells in the lab. These technologies allowed them to "poke" the cells and observe how they feel and move. Cells had long been thought to be syrupy in texture on the inside, but during his experiments Dr. Fredberg saw that they moved as though they were filled with material more in consistency like shaving cream or toothpaste.

That discovery, ground-breaking in its own right, led Dr. Fredberg to consider how eukaryotes, complex cells with a nucleus and organelles, might have evolved from prokaryotes, more primitive bacteria-like cells with simpler structures.

In honor of his illuminating work, the American Physiological Society has selected Dr. Fredberg to present the Walter B. Cannon Memorial Lecture at its Experimental Biology 2010 conference. The lecture is the Society's pre-eminent award lecture and is designed to recognize an outstanding scientist for his or her contributions to the field.

#### Narrow Question, Broad Implications

Dr. Fredberg sought to study the smooth muscle cells in the lungs and airways to try to determine why the airways get stuck in a state of constriction during an asthma attack. His team of biologists, engineers and physicists worked together to design nanotechnologies that would allow them to manipulate the cells on the molecular level and see how they moved and behaved.

The classic description of a cell is that of a balloon filled with a viscous fluid, like honey. When cells subjected to the team's experiments didn't behave that way, Dr. Fredberg was taken aback.

## Undergraduate Students

*"I honour, and shall always honour, every one who advances the noble science of physiology."* — **Charles Darwin**

"If you could shrink yourself down to the size of a cell and poke it with your finger, what would it feel like? The textbooks say that it would feel like an elastic balloon filled with a viscous material," he said. "But we saw that mechanically, it behaves more like cold cream or shaving cream, or even toothpaste. That didn't fit with anything in the literature."

That finding was iconoclastic. "Everyone wants to know how cells move—for example, how cancer cells crawl, or how smooth muscle cells contract—and here we were saying the mechanical picture was fundamentally flawed," he said. "That led to 10 years of struggle, along with a good deal of criticism."

The criticism was worth it, and even helpful, Dr. Fredberg added. Once others defeated their own skepticism by reproducing his results in their own experiments, they realized that the discovery might have implications for understanding how diseases like asthma and cancer work.

### An Idea About Evolution

Dr. Fredberg's idea about eukaryotes woke him up—literally. "In the middle of the night, I sat up thinking 'Maybe this analogy between living cells and inert soft matter [like shaving cream] isn't just a coincidence. Maybe it was driven by an evolutionary process, a major selective pressure working over a long period of time,'" he said.

Prokaryotes, like present-day bacteria, originated roughly 3.5 billion years ago. The human body is built of eukaryotes, however, which appeared much later, roughly 2 billion years ago. Eukaryotes don't have rigid walls, but each eukaryote does have a nucleus and organelles such as mitochondria, which produce energy.

Dr. Fredberg's theory is that cells that had lost their rigid wall were able to "crawl" through and invade organic sediment, perhaps at the bottom of the ocean. "The big question then is how do you maintain shape and mechanical stability once you've lost your rigid wall?"

The answer would be to erect a pliable, malleable scaffolding—a cytoskeleton—within the cell. In other words, eukaryotes may have adapted through early evolution to work optimally within their soft micro-environment.

Dr. Fredberg will discuss his theory when he presents his Cannon lecture, "Physiology in Perspective: A Hard Day in the Life of a Soft Cell," on Saturday, April 24, at 5:45 p.m. in Ballroom B of the Anaheim Convention Center.

**NOTE TO EDITORS:** The APS annual meeting is part of the Experimental Biology 2010 conference that will be held April 24-28, 2010 at the Anaheim Convention Center. The press is invited to attend or to make an appointment to interview **Dr. Fredberg**. Please contact Donna Krupa at 301.634.7209 (office)/703.967.2751 (cell) or [dkrupa@the-aps.org](mailto:dkrupa@the-aps.org).

*Physiology is the study of how molecules, cells, tissues and organs function in health and disease. Established in 1887, the American Physiological Society (APS) was the first U.S. society in the biomedical sciences field. The Society represents more than 11,000 members and publishes 14 peer-reviewed journals with a worldwide readership.*

### Related Items

#### Univ of Louisville Professor Earns APS's Cannon Award

**Released April 11, 2011** - American Physiological Society has selected Roberto Bolli, MD, Chief of the Division of Cardiovascular Medicine at the University of Louisville in Louisville, Kentucky, to present the Walter B. Cannon Memorial Lecture at the Experimental Biology 2011 meeting.

#### Tulane University Professor to Receive APS's Top Honor

**Released April 21, 2012** - Tulane University Professor L. Gabriel Navar receives the American Physiological Society's top honor, the Walter B. Cannon Award, at ASP' 125th anniversary meeting.

#### Mayo Clinic Anesthesiologist Earns APS's Walter B. Cannon Award

**Released April 20, 2013** - Michael Joyner, M.D. will present the American Physiological Society's Walter B. Cannon Award Lecture on April 20, 2013, during the Society's 126th annual meeting. The Cannon Award is the Society's pre-eminent award. The Mayo Clinic anesthesiologist will discuss physiology's enduring relevancy.

© 2015 The American Physiological Society

9650 Rockville Pike | Bethesda, MD | 20814-3991 | Main: 301.634.7164 | Fax: 301.634.7241 [Privacy Policy](#) | [Site Map](#) | [Contact Us](#) | [Google+](#)

---

~/Custom.Templates/PressRelease.aspx