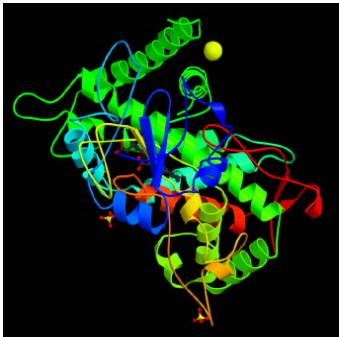


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***A Hard Day in the Life  
of a Soft Cell:  
Physical Laws  
Governing Cytoskeletal  
Deformation,  
Contraction,  
and Remodeling***



***Professor  
Jeffrey J. Fredberg  
Harvard University  
11 February 2008  
Social Hour: 11:30-12:00 noon  
Seminar: 12:00-1:00 pm  
Room E2214  
Engineering Building East***

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***ABSTRACT***

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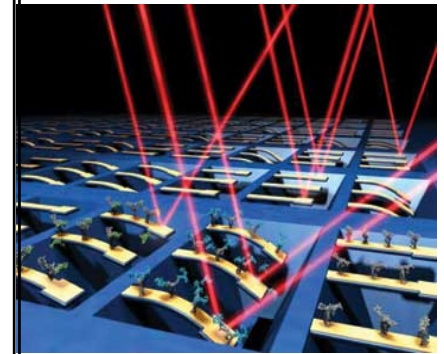
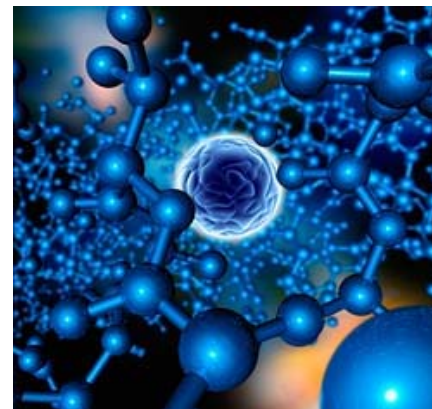
With every beat of the heart, inflation of the lung, or peristalsis of the gut, cell types of diverse function are subjected to substantial stretch. New data show that cell responses to a transient stretch exhibit remarkable physical similarities to fluidization observed in jammed inert matter including colloids, pastes, emulsions, and foams, and thus implicate mechanisms mediated not only by specific signaling intermediates, as is usually presumed, but also by non-specific actions of a slowly evolving network of physical forces. These results support the idea that the cell interior is at once a crowded chemical space and a fragile soft material in which the effects of biochemistry, molecular crowding, and physical forces are complex and inseparable, yet conspire nonetheless to yield remarkably simple phenomenological laws. These laws appear to be universal and thus comprise a striking point of contact between the worlds cell biology and soft matter physics.

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***Bio***

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Jeffrey Fredberg is a Professor of Bioengineering and Physiology in the Department of Environmental Health at the Harvard School of Public Health, where he served as Director of the Physiology Program from 1997–2006. He received his B.S. in Mechanical Engineering from Tufts University and his Ph.D. in Mechanical Engineering from M.I.T. Professor Fredberg has published 171 papers in the peer-reviewed literature and holds 10 U.S. patents. He is a Fellow of the Biomedical Engineering Society and is principal investigator of three active research grants supported by the National Heart, Lung, and Blood Institute. Professor Fredberg's laboratory seeks to discover physical laws governing the abilities of the cytoskeleton to deform, contract, and remodel. These basic mechanical processes underlie a range of higher level phenomena in health and disease including many aspects of cancer, cardiovascular disease, malaria, and morphogenesis, but his laboratory's major research emphasis is the role of these processes in airway narrowing in asthma.



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