

## PHYSIOLOGY PROGRAM

Department of Environmental Health  
Harvard School of Public Health  
(617) 432-1193



## FACULTY

**Robert B. Banzett, Ph.D.** (617) 432-1546

*Associate Professor of Physiology, HSPH and HMS*  
Perception of afferent information from the respiratory system; dyspnea; respiratory airflow in birds; control of respiration, especially proprioceptive respiratory reflexes, and the action and control of respiratory muscles.

**Joseph D. Brain, S.D. in Hyg.** (617) 432-1272

*Cecil K. and Philip Drinker Professor of Environmental Physiology, HSPH;*  
*Chair, Dept of Environmental Health, HSPH;*  
Function and structure of pulmonary macrophages; deposition and clearance of inhaled particles and responses to them; delivery of drugs to and through the lungs; pathogenesis of occupational lung disease; and comparative aspects of respiratory defense mechanisms.

**James P. Butler, Ph.D.** (617) 432-1662

*Lecturer on Physiology, HSPH*  
Applied mathematics and physics in respiratory physiology and related problems of measurement, signal processing, analysis, and interpretation; light scattering and stereology; aerodynamics of flow in the avian lung; magnetic twisting cytometry.

**Jack Dennerlein, Ph.D.** (617) 432-2028

*Assistant Professor of Ergonomics and Safety, Dept. of Environmental Health, HSPH*  
The etiology of work-related chronic musculoskeletal disorders and the design of human-machine interfaces that aid in both rehabilitation and prevention of these injuries. These interests include orthopaedic and occupational biomechanics of the upper extremity, motor control of human movement, ergonomics and the design and performance of hepatic (human-hand and machine) interfaces.

**Jeffrey M. Drazen, M.D.**

*Professor of Physiology, HSPH*  
*Professor of Medicine, HMS*  
*Editor, New England Journal of Medicine*  
Pulmonary and respiratory pharmacology; mediators of immediate hypersensitivity; mucus regulation and expression in chronic bronchitis.

**Jeffrey J. Fredberg, Ph.D.** (617) 432-0198

*Professor of Biomedical Engineering and Physiology, HSPH*  
*Director, The Physiology Program*  
Lung mechanics; mechanical properties of connective tissue; mechanical properties of contractile cells; airway mechanics; fluid flow in airways; mechanics of the gas-liquid interface of the lung; aerosol kinetics; surfactant replacement therapy.

**John J. Godleski, M.D.** (617) 432-1252

*Associate Professor in the Department of Environmental Health, HSPH*  
*Associate Professor of Pathology, Brigham & Women's Hospital, HMS*  
Pulmonary pathology; pathology of lung responses to inhaled materials; pulmonary macrophage functions, cellular interactions and immunology.

**Beatriz González-Flecha, Ph.D.** (617) 432-1277

*Assistant Professor of Molecular Biology and Environmental Health, HSPH*  
Biochemistry and molecular biology of oxidant-mediated lung injury; characterization of the intracellular sources of oxygen free radicals and their regulation; Genetic responses to oxidative stress; molecular mechanisms of oxidative damage; oxygen free radicals as second messengers; Oxidant-dependent promotion of cell growth in the lung epithelium.

**Lester Kobzik, M.D.** (617) 432-2247

*Associate Professor in the Department of Environmental Health, HSPH*  
*Associate Professor of Pathology, Brigham & Women's Hospital, HMS*  
Lung macrophage differentiation and function, especially phagocytosis and cytokine production; flow cytometry and its applications for lung cell biology.

**Stephen H. Loring, M.D.** (617) 667-3092

*Associate Professor in the Department of Environmental Health, HSPH*  
*Associate Professor of Anesthesia, HMS*  
Action and control of respiratory muscles; mathematical models of the chest wall; chest wall mechanics; mechanics of lung transplantation and lung volume reduction surgery for emphysema; gas exchange in closed body cavities; mechanics of the pleural space.

**Joseph P. Mizgerd, S.D.** (617) 432-2627

*Assistant Professor of Physiology and Cell Biology, HSPH*

The roles played by receptors for the early response cytokines and by subunits of the NF- $\kappa$ B transcription factor family in dictating the expression and function of adhesion molecules and chemokines in the lungs, in directing neutrophil emigration and activation, and in balancing the protective and destructive effects of pulmonary inflammatory responses.

**Stephanie A. Shore, Ph.D.** (617) 432-0199

*Senior Lecturer on Physiology, HSPH*

Airway smooth muscle cell biology, especially the effects of cytokines; role of neuropeptides in airway responses to inhaled irritants.

**Nancy Long Sieber, Ph.D.** (617) 432-3484

*Lecturer on Physiology, HSPH*

Mechanisms of pulmonary inflation, particularly interactions between lung infection and air pollution; transport of heavy metals from the respiratory and gastrointestinal tracts

**Eric Silverman, M.D.** (617) 432-1658

*Assistant Professor of Physiology, HSPH*

*Assistant Professor of Medicine, HMS*

Gene regulatory mechanisms and how gene sequence variability affects the pathogenesis of asthma and other pulmonary diseases

**George Topulos, M.D.**

*Assistant Professor of Environmental Health, HSPH*

*Assistant Professor of Anaesthesia, HMS*

Applied respiratory mechanics; environmental, exercise, and comparative mammalian physiology.

**Daniel J. Tschumperlin, Ph.D.** (617) 432-4381

*Assistant Professor of Airway Biology, HSPH*

Remodeling of the airway wall and its implications in asthma; transduction of physical forces at a cellular and molecular level; micromechanical properties of cells and their extracellular matrix.

**Richard L. Verrier, Ph.D., F.A.C.C.** (617) 632-1820

*Associate Professor in the Department of Environmental Health, HSPH*

*Co-Director, Institute for Prevention of Cardiovascular Disease, BIDMC*

Neural, behavioral, and environmental triggers of sudden cardiac death and arrhythmias, with emphasis on ischemia, anger, REM sleep, and exposure to environmental air particles; computerized analysis of electrocardiographic markers of vulnerability to life-threatening arrhythmias, especially T-wave alternans. Selective delivery of agents to the heart via the pericardial sac.

**Ning Wang, S.D.** (617) 432-1686

*Associate Professor of Physiology and Cell Biology, HSPH*

Cytoskeletal mechanics, mechanochemical signal transduction, cell adhesion and migration, cancer metastasis, effects of mechanical forces on cells.

## **RESEARCH SCIENTISTS**

**Andrew Binks, Ph.D.**

*Research Scientist in Physiology, HSPH*

Respiratory sensations and the neural control of breathing in humans.

**Srboljub Mijailovich, Ph.D.**

*Senior Research Scientist, Physiology, HSPH*

Mathematical modeling of muscle contraction based on actomyosin cycle, 3D geometry of sarcomere and (molecular) muscle activation; mechanical properties of airway smooth muscle at the level of tissue, cells and molecules; novel finite element modeling for biological tissues, solids and fluids.

**Shakeeb Moosavi, Ph.D.**

*Research Scientist, Physiology, HSPH*

Behavioral control of breathing; dyspnea; cardiorespiratory responses to exercise and imagined exercise; sensory and motor function after severe brain injury in humans

**Akira Tsuda, Ph.D.**

*Principal Research Scientist in Physiology, HSPH*

Fluid mechanics; heat and mass transport; aerosol science; chaotic mixing; nonlinear dynamics; physiological fluid dynamics; intrapulmonary transport phenomena.

## **RESEARCH ASSOCIATES**

### **Steven An, Ph.D.**

*Research Associate, Physiology, HSPH*

Biophysical properties of airway smooth muscle in relationship to airway hyperresponsiveness.

### **Robert Brown, M.D.**

*Assistant Professor of Medicine, HMS*

*Chief, Pulmonary Section, Brockton/West Roxbury*

*Department of Veteran Affairs Medical Center*

Respiratory dysfunction in spinal cord injury; chronic obstructive pulmonary disease; pathophysiology of breathlessness.

### **Mark Coughlin, Ph.D.**

*Research Associate, Physiology, HSPH*

The microstructural basis of cell and cytoskeletal mechanics

### **Edgar Diaz, M.D.**

*Research Associate, Physiology, HSPH*

Ambient particles; pulmonary function; pulmonary inflammation; inhalation toxicology

### **Frederic G. Hoppin, Jr., M.D.**

*Professor of Medicine and Physiology, Emeritus,*

*Brown University*

Mechanical properties of lungs and airways; micromechanics of lung; mechanisms of flow limitation; chest wall muscles.

### **Ramon Molina, D.V.M., D.Sc.**

*Research Associate, Physiology, HSPH*

Respiratory defense mechanisms; role of pulmonary intravascular macrophages in lung injury; mechanisms in pulmonary fibrosis; the role of alveolar macrophages in pneumocystis pneumonia.

### **Rick Rogers, Ph.D.**

*Research Associate, Physiology, HSPH*

*Director, Bioimaging Laboratory*

Pulmonary fate and distribution of exogenous proteins and therapeutic aerosols; pulmonary clearance mechanisms; alveolar macrophage interactions with biopolymeric nanoparticles; 3-D lung cell architecture.

### **Samuel Sigaud, Ph.D.**

*Research Associate, Physiology, HSPH*

Effects of inhaled particles on inflammation and oxidative stress in the lung

### **Pawel Szymanski, Ph.D.**

*Research Associate, Physiology, HSPH*

The thin filament-based regulation of contractility in smooth muscle. To understand the role of protein categories that differentiate the phasic versus tonic smooth muscles in shaping contractility in these muscles. Molecular basis of abnormalities in smooth muscle contractile machinery that leads to asthma disease

### **Florence Tao, Ph.D.**

*Research Associate, Physiology, HSPH*

Mechanisms of cellular effects of ambient particles; role of scavenger receptors in resolving cellular inflammation

## **VISITING SCIENTISTS, LECTURERS**

### **Barbara Beck, Ph.D.**

*Instructor, Physiology*

*Principal/Toxicologist, Gradient Corporation, Cambridge, MA*

Animal models of pulmonary disease caused by inhaled particles.

### **Ben Fabry, Ph.D.**

*Visiting Scientist in Physiology, HSPH*

*Professor and Director, Institute for Biomedical Technology, Erlangen University*

Engineering aspects of magnetic twisting cytometry; oscillatory cell mechanics; mechanical properties of apoptotic cells.

### **Henry A. Feldman, Ph.D.**

*Visiting Scientist, Physiology Program, HSPH*

*Clinical Research Core Program, Children's Hospital*

Mathematical modeling and statistical analysis; cardiovascular epidemiology

### **Robert I. Kavet, Sc.D.**

*Instructor, Physiology Program, HSPH*

*Senior Scientist, Electric Power Research Institute, Palo Alto, CA*

Health effects of environmental hazards; electric and magnetic fields and cancer, toxicity of inhaled methanol.

**Milos Kojic, Ph.D.**

*Visiting Scholar in Physiology, HSPH*  
*Professor of Mechanical Engineering, University of Kragujevac, Serbia*  
Finite element analysis of solids, fluids and general field problems; inelastic analysis; coupled problems of several fields; biomechanics; numerical methods and finite element software

**Robert Lansing, M.D.**

*Visiting Lecturer on Respiratory Biology*  
*Professor of Psychology, University of Arizona*  
Perceptions from the lungs and chemoreceptors; voluntary control of respiration muscles.

**Paulo Silveira, M.D.**

*Visiting Scientist, Physiology Program, HSPH*  
Network dynamics applied to cytoskeleton; population dynamics of infectious diseases

**Dimitrije Stamenovic, Ph.D.**

*Visiting Scientist in the Department of Environmental Health, HSPH*  
*Associate Professor of Biomedical Engineering, Boston University*  
Applications of methods of solid mechanics in biological systems, particularly tissue elasticity; micromechanics of lung parenchyma; lung stability; dynamic behavior of respiratory tissues; rheology of foams.

**RESEARCH FELLOWS****M. Simo Arredouani, Ph.D.**

*Mentor: Dr. Lester Kobzik*  
Involvement of macrophage class A scavenger receptors in lung inflammation

**Predrag Bursac, Ph.D.**

*Mentor: Dr. Jeffrey J. Fredberg*  
Cell rheology, remodeling and mechanics; Mechanics of complex fluids

**Jianxin Chen, M.S.**

*Visiting Fellow in Physiology*  
*Mentor: Dr. Ning Wang*  
Cytoskeletal structure and its relationship with cell growth, differentiation, migration, protein synthesis, and death; application of magnetic twisting cytometry to cell mechanics.

**Rene Dickie, Ph.D.**

*Mentor: Dr. Rick A. Rogers*  
Pulmonary functional morphology and development

**Debora Faffe, M.D.**

*Mentor: Dr. Stephanie Shore*  
Effects of cytokines on human airway smooth muscle

**Alexey Fedulov, M.D., Ph.D.**

*Mentor: Dr. Lester Kobzik*  
Immune aspects of maternal transmission of asthma

**Nenad Filipovic, Ph.D.**

*Mentor: Dr. Srbojjub Mijailovich*  
Software development and scientific visualization of muscle contraction based on actomyosin cycle, 3D geometry of sarcomere and (molecular) muscle activation; novel finite element modeling for biological tissues, solids and fluids.

**Elisa Ghelfi, Ph.D.**

*Mentor: Dr. Beatriz González-Flecha*  
Lung physiology related to air pollution; enzyme activity during inflammation; oxidant and anti-oxidant imbalance in lung disease; cardiovascular disease and air pollution

**Matthew Jones, Ph.D.**

*Mentor: Dr. Joseph P. Mizgerd*  
Inflammation and NF- $\kappa$ B signalling in the lung during infection

**Stanley Hu, Ph.D.**

*Mentor: Dr. Ning Wang*  
Mechanical properties of airway smooth muscle at the level of cells, bio-image processing

**Barbekka Hurtt, Ph.D.**

*Mentor: Dr. Joseph Brain*  
Role of nervous system in producing coordinated motor behaviors; particulate deposition in the brain

**Rachel Laudadio, Ph.D.**

*Mentor: Dr. Jeffrey Fredberg*  
Actin modulation in airway mechanics

**Adriana Leme, Ph.D.**

*Mentor: Dr. Lester Kobzik*  
Role of nursing in maternal transmission of asthma susceptibility

**Miriam Lemos, Ph.D.**

*Mentor: Dr. John Godleski*  
Ambient particles; morphometry; immunocytochemistry; reactive oxygen species

**Guillaume Lenormand, Ph.D.**

*Mentor: Dr. Jeffrey J. Fredberg*

Mechanical properties of living cells

**Mariangela Macchione, Ph.D.**

*Mentor: Dr. Beatriz González-Flecha*

Biological effects of concentrated ambient particles (CAP) in primary cultures of alveolar type II cells (ATII)

**Aleksandar Marinkovic, M.S.**

*Mentor: Dr. Srboljub Mijailovich*

Mechanical properties of airway smooth muscle at the level of tissue.

**Marina Puig de Morales, Ph.D.**

*Mentor: Dr. Jeffrey Fredberg*

The microstructural basis of cell and cytoskeletal mechanics; cell rheology, remodeling and mechanics

**Yadira Rivera, M.D.**

*Mentor: Dr. Stephanie A. Shore*

Obesity and its relationship to asthma in a murine model.

**Timothy Sulahian, Ph.D.**

*Mentor: Dr. Lester Kobzik*

Function of the scavenger receptor MARCO in relation to airborne particulates

**Zhiping Yang, Ph.D.**

*Mentor: Dr. Lester Kobzik*

Gender effects on immune function

**Hongwei Zhou, Ph.D.**

*Mentor: Dr. Lester Kobzik*

Identification of new scavenger receptor on the cell surface of lung macrophage in rat

**GRADUATE STUDENTS**

**Jamie Rosenblum Lichtenstein** (started 1998)

*Advisor: Dr. Joseph D. Brain*

Murine strain determinants of pulmonary response to *Stachybotrys chartarum*

**Matthew Mellema** (started 2000)

*Advisor: Dr. Stephanie A. Shore*

Genetic and physiologic basis of strain-dependent patterns of native airway responsiveness in mice

**Greg Wellenius** (started 2001)

*Advisor: Dr. John Godleski*

Cardiovascular effects of particulate air pollution