



**Organizing Committee:**

Rahim R. Rizi, Ph.D.  
Warren B. Geftter, M.D.  
Stephen Kadlecck, Ph.D.  
Maurizio Cereda, M.D.  
Masaru Ishii, M.D., Ph.D.  
David Mankoff, M.D., Ph.D.  
Mitchell Schnall, M.D., Ph.D.

**Scientific Committee:**

Giles Santyr, Ph.D.  
John P. Mugler, Ph.D.  
Eric Hoffman, Ph.D.  
Robert H. Brown, M.D.  
James D. Crapo, M.D.  
Jim Wild, Ph.D.  
Sean B. Fain, Ph.D.  
Jason Woods, Ph.D.

**Location:**

University of Pennsylvania  
421 Curie Boulevard  
Biomedical Research Building  
II/III  
Philadelphia, PA, 19104

# The 2017 International Workshop on Pulmonary Imaging

*Philadelphia, PA  
March 2-4, 2017*

*Hosted by:  
Department of Radiology  
and*

*Functional and Metabolic Imaging Group (FMIG)*

*Sponsored by:*



GE Healthcare



**4Dx**



National Heart  
Lung and Blood Institute

# Program Schedule

**Thursday, March 2, 2017**

**7:00 – 8:00 AM**                      **Registration & Breakfast**

**8:00 – 8:10 AM**                      **Introductory Remarks**  
Rahim R. Rizi, Ph.D.  
University of Pennsylvania

**8:10 – 8:20 AM**                      **Welcome Remarks**  
Mitchell D. Schnall, M.D., Ph.D.  
University of Pennsylvania

## **Session I: Keynote Lectures – Part I** **Moderator: Mitchell D. Schnall, M.D., Ph.D.**

**8:20 – 8:40 AM**                      **Potential Contributions of Pulmonary Imaging in Precision Medicine**  
Thomas L. Croxton, M.D., Ph.D.  
National Institutes of Health

**8:40 – 9:05 AM**                      **Idiopathic Interstitial Pneumonias: Progress in Radiographic-Pathologic Correlations**  
Talmadge King, M.D.  
University of California, San Francisco

**9:05 – 9:25 AM**                      **Image Based Subtypes of COPD – Impact on Diagnosis and Therapy**  
James D. Crapo, M.D.  
National Jewish Health

**9:25 – 9:45 AM**                      **The Role of Imaging for Surgical Treatment of Emphysema**  
Joel D. Cooper, M.D.  
University of Pennsylvania

**9:45 – 10:05 AM**                      **Emerging Functional Measures of the Lung with Dual Energy CT**  
Eric A. Hoffman, Ph.D.  
University of Iowa

**10:05 – 10:20 AM**                      **Discussion**  
**10:20 – 10:35 AM**                      **Break**

## **Session II: New Clinical Indications** **Moderator: Warren B. Gelfer, M.D.**

**10:35 – 10:55 AM**                      **Asthma: Precision Approaches**  
Reynold A. Panettieri, Jr., M.D.  
Rutgers University

**10:55 – 11:15 AM**                      **COPD Imaging: Finding the Beginning**  
Robert H. Brown, M.D.  
Johns Hopkins University

**11:15 – 11:35 AM**                      **PET Imaging of Regional Pulmonary Vasodilation Before and After Inhaled Nitric Oxide in Pulmonary Hypertension**  
Robert Scott Harris, M.D.  
Harvard University

**11:35 – 11:55 AM**                      **How Can Imaging Support Drug Development for Lung Diseases? An Industry Perspective**  
Alexandre Coimbra, Ph.D.  
Genentech, Inc.

11:55 AM – 12:15 PM **Out of Body Organ Perfusion: Yesterday, Today and Tomorrow**  
Edward Cantu, M.D.  
University of Pennsylvania

12:15 – 12:30 PM **Discussion**  
12:30 – 1:20 PM **Lunch**

**Session III: Graduate Student and Postdoctoral Presentations – Part I**  
**Moderators: Delphine L. Chen, M.D. and Heather Jones, M.D.**

1:20 – 1:30 PM **Type I Collagen-targeted PET Probe for Pulmonary Fibrosis Detection and Staging in Preclinical Models**  
Pauline Désogère, Ph.D.  
Harvard University

1:30 – 1:40 PM **Assessment of Regional Pulmonary Blood Flow Using <sup>68</sup>Ga-DOTA PET**  
Arnoldo Santos, M.D., Ph.D.  
Spanish National Center for Cardiovascular Research, Spain

1:40 – 1:50 PM **Improving Quantification of PET/CT Biomarkers for Evaluation of Disease Progression and Treatment Effectiveness in Pulmonary Fibrosis**  
Beverley Holman, Ph.D.  
University College London, United Kingdom

1:50 – 2:00 PM **Ultra-short Echo Time MRI Yields CT-like Visualization of Neonatal Lung Parenchymal Pathologies and the Potential for Objective, Quantitative Characterization of Neonatal Lung Disease Severity**  
Nara S. Higano, M.S.  
Cincinnati Children's Hospital Medical Center

2:00 – 2:10 PM **Parametric Response Maps to Measure the Effects of Prone Position in Pigs with Experimental Lung Injury**  
Yi Xin, M.S.  
University of Pennsylvania

2:10 – 2:20 PM **High-resolution Strain Heterogeneity During Early Acute Lung Injury**  
Gabriel Motta-Ribeiro, M.S.  
Harvard University

2:20 – 2:30 PM **Break**

**Session IV: Molecular Imaging of Pulmonary Disorders**  
**Moderators: Sean B. Fain, Ph.D.**

2:30 – 2:50 PM **Molecular Imaging of Pulmonary Fibrosis**  
Peter Caravan, Ph.D.  
Harvard University

2:50 – 3:10 PM **An Integrated Imaging Approach for Evaluating Pulmonary Disorders**  
Rahim R. Rizzi, Ph.D.  
University of Pennsylvania

3:10 – 3:30 PM **Imaging Carbon Monoxide Diffusion in the Lungs with Positron Emission Tomography**  
Delphine L. Chen, M.D.  
Washington University School of Medicine

3:30 – 3:50 PM

**Folate Targeted Intraoperative Imaging of Pulmonary Tumors**

Sunil Singhal, M.D.  
University of Pennsylvania

3:50 – 4:05 PM

**Discussion**

4:05 – 4:20 PM

**Break**

**Session V: Pediatrics and Lung Injury**

**Moderator: Jason D. Christie, M.D.**

4:20 – 4:40 PM

**Hyperpolarized  $^{129}\text{Xe}$  MRI of Pediatric Lung Diseases**

Giles Santyr, Ph.D.  
Hospital for Sick Children, Canada

4:40 – 5:00 PM

**PET-CT Imaging of Early Acute Lung Injury and Its Regional Tissue Biological Correlates**

Marcos F. Vidal Melo, M.D., Ph.D.  
Harvard University

5:00 – 5:20 PM

**Ventilator Induced Lung Injury and Early Prediction of ARDS Survival**

Maurizio F. Cereda, M.D.  
University of Pennsylvania

5:20 – 5:40 PM

**Visualizing Lung Function and the Vascular Response in Acute Lung Injury**

Heather Jones, M.D.  
Cedars-Sinai Medical Center

5:40 – 6:00 PM

**First in Human X-Ray Measurement of Lung Motion and Ventilation: Case Studies in Radiation Induced Lung Injury**

Andreas Fouras, Ph.D.  
Monash University, Australia

6:00 – 6:20 PM

**Quantitative Pulmonary MRI in the Neonatal Intensive Care Unit**

Laura Walkup, Ph.D.  
Cincinnati Children's Hospital

6:20 – 6:40 PM

**Imaging Approach for Adult Thoracic Lymphatic Disorders**

Maxim Itkin, M.D.  
University of Pennsylvania

6:40 – 6:50 PM

**Discussion**

## **Friday, March 3, 2017**

7:00 – 7:45 AM

**Continental Breakfast**

### **Session VI: Keynote Lectures – Part II** **Moderator: Eric A. Hoffman, Ph.D.**

7:45 – 8:05 AM

**Response Assessment of Molecularly Targeted Therapy for Lung Cancer**

David A. Mankoff, M.D., Ph.D.  
University of Pennsylvania

8:05 – 8:25 AM

**Airway Obstruction and Lung Hyperinflation in Asthma: Is it the Chicken or the Egg?**

Jose Venegas, Ph.D.  
Harvard University

8:25 – 8:45 AM

**Advanced Image Characterization of Pulmonary Nodules: Volumetric vs. Histogram Analysis**

David P. Naidich, M.D.  
New York University

8:45 – 9:05 AM

**GOLD Report 2017: Current and Future Role of Chest Imaging in Assessment and Treatment**

Gerard J. Criner, M.D.  
Temple University

9:05 – 9:15 AM

**Discussion**

9:15 – 9:25 AM

**Break**

### **Session VII: Obstructive Lung Disease** **Moderator: James D. Crapo, M.D.**

9:25 – 9:45 AM

**Quantitative CT in Pulmonary Fibrosis**

David Lynch, M.D.  
National Jewish Health

9:45 – 10:05 AM

**Imaging the Lung in the General Population: Results from the CanCOLD Study**

Harvey Coxson, Ph.D.  
University of British Columbia, Canada

10:05 – 10:25 AM

**Redefining COPD: Implications for Diagnosis and Treatment**

MeiLan Han, M.D.  
University of Michigan

10:25 – 10:45 AM

**Assessment of Pulmonary Arterial and Bone Morphometry in Smokers with COPD**

Punam K. Saha, Ph.D.  
University of Iowa

10:45 – 11:05 AM

**What Does Multimodality Imaging Tell Us about COPD**

Miranda Kirby, Ph.D.  
Center for Heart Lung Innovation, Canada

11:05 – 11:15 AM

**Discussion**

11:15 – 11:25 AM

**Break**

**Session VIII: Structure/Function**  
**Moderator: Bastiaan Driehuys, Ph.D.**

- 11:25 – 11:45 AM**      **Physiologists Playing with Protons**  
Kim Prisk, Ph.D.  
University of California, San Diego
- 11:45 AM – 12:05 PM**      **How Lung Microstructure Affects Lung Function**  
Dmitriy Yablonskiy, Ph.D.  
Washington University, Saint Louis
- 12:05 – 12:25 PM**      **Structure-function Imaging of Lung Disease Using UTE and HP Gas MRI**  
Sean B. Fain, Ph.D.  
University of Wisconsin
- 12:25 – 12:45 PM**      **Pulmonary UTE MRI with Dynamic 3D Self-navigation**  
Peder Larson, Ph.D.  
University of California, San Francisco
- 12:45 – 12:55 PM**      **Discussion**  
**12:55 – 1:40 PM**      **Lunch**

**Session IX: Graduate Student and Postdoctoral Presentations – Part II**  
**Moderator: John P. Mugler, Ph.D.**

- 1:40 – 1:50 PM**      **Towards Improved Metrics of Segmentation Agreement for Lung Imaging Analysis**  
Alberto Biancardi, Ph.D.  
Sheffield University, United Kingdom
- 1:50 – 2:00 PM**      **Oxygen-Induced T<sub>1</sub> Signal Loss During Multiple Breath Wash-out Hyperpolarized <sup>129</sup>Xe MRI in Rat Lungs**  
Felipe Morgado, B.S.  
Hospital for Sick Children, Canada
- 2:00 – 2:10 PM**      **Temporally-resolved Computed Tomographic (CT) Imaging to Assess High-frequency Periodic Deformation**  
Jacob Herrmann, M.S.  
University of Iowa
- 2:10 – 2:20 PM**      **Multi-parametric Map Using Hyperpolarized Gas MR Imaging to Retain Regionality**  
Hooman Hamedani, M.S.  
University of Pennsylvania
- 2:20 – 2:30 PM**      **Proton MRI Suggests That the Spatial Pattern of Methacholine Bronchoconstriction May Be Non-random**  
Eric T. Geier, B.S.  
University of California, San Diego
- 2:30 – 2:40 PM**      **Inflammatory and Non-inflammatory Contributions to Ventilation Heterogeneity in Severe, Poorly-controlled Asthmatics**  
Sarah Svenningsen, Ph.D.  
Robarts Research Institute, Canada
- 2:40 – 2:50 PM**      **Impact of Helium-oxygen Inhalation on Aerosol Deposition in Asthmatic Rats Using UTE-MRI**  
Boucneau Tanguy, M.S.  
University Paris-Saclay, France
- 2:50 – 3:00 PM**      **Break**

**Session X: Proton MRI**  
**Moderator: Jason Woods, Ph.D.**

- 3:00 – 3:20 PM**      **Quantitative Proton Lung MRI: Relaxometry and More**  
Peter M. Jakob, Ph.D.  
University of Wuerzburg, Germany
- 3:20 – 3:40 PM**      **MR Elastography of the Lung: A Non-Invasive Biomarker of Fibrotic Interstitial Lung Disease**  
Kiaran McGee, Ph.D.  
Mayo Clinic
- 3:40 – 4:00 PM**      **Quantifying Regional Ventilation-perfusion Matching with Proton MRI**  
Susan R. Hopkins, M.D., Ph.D.  
University of California, San Diego
- 4:00 – 4:15 PM**      **Quantitative Susceptibility Mapping as a Probe of Lung Structure and Function**  
Zackary Cleveland, Ph.D.  
Cincinnati Children's Hospital Medical Center
- 4:15 – 4:30 PM**      **Quantification of Airway Inflammation Following Endobronchial Allergen and Endotoxin Challenge with Magnetic Resonance Imaging**  
Jens M. Hohlfeld, M.D.  
Fraunhofer Institute for Toxicology and Experimental Medicine ITEM
- 4:30 – 4:45 PM**      **Pulmonary UTE MRI: Climbing Above Feasibility Studies**  
Scott Nagle, M.D., Ph.D.  
University of Wisconsin
- 4:45 – 5:00 PM**      **Pulmonary Imaging Using High-Dimensional Flow MRI**  
Joseph Cheng, Ph.D.  
Stanford University
- 5:00 – 5:10 PM**      **Discussion**
- 5:10 – 5:20 PM**      **Break**

**Session XI: Advances in Pulmonary Imaging Technology – Part I**  
**Moderator: Jim Wild, Ph.D.**

- 5:20 – 5:35 PM**      **Hyperpolarized  $^{13}\text{C}$  Tools to Simultaneously Assess Organ pH and Metabolism**  
Stephen Kadlecsek, Ph.D.  
University of Pennsylvania
- 5:35 – 5:50 PM**      **Label-free Endomicroscopy Technology Towards Real-time Imaging of Tissue Histology In Vivo**  
Xingde Li, Ph.D.  
Johns Hopkins University
- 5:50 – 6:05 PM**      **MRI Illuminated by  $\gamma$ -rays**  
G. Wilson Miller, Ph.D.  
University of Virginia
- 6:05 – 6:20 PM**      **Methods for Enhancing NMR and MRI with Hyperpolarized Xenon and SABRE**  
Boyd Goodson, Ph.D.  
Southern Illinois University



6:20 – 6:35 PM	<b>Current Status of Commercial Hyperpolarized Xenon Technology, Dissemination and Regulatory Approval</b> Kiarash Emami, Ph.D. Polarean, Inc.
6:35 – 6:50 PM	<b>Hyperpolarized <math>^{129}\text{Xe}</math>: Accelerating Towards FDA Approval</b> F. William Hersman, Ph.D. University of New Hampshire
6:50 – 7:00 PM	<b>Discussion</b>
7:00 – 8:00 PM	<b>Poster Session and Light Reception</b>

## **Saturday, March 4, 2017**

7:00 – 8:00 AM **Continental Breakfast**

### **Session XII: $^{19}\text{F}$ MRI of the Lung Moderator: Giles Santyr, Ph.D.**

8:00 – 8:20 AM	<b>Applications of F-19 MRI in Clinical Trials and Aiming at the Clinic</b> H. Cecil Charles, Ph.D. Duke University
8:20 – 8:40 AM	<b><math>^{19}\text{F}</math> – MRI for Quantifying Regional Ventilation Dynamics</b> Jens Vogel-Claussen, Ph.D. University of Hanover, Germany
8:40 – 9:00 AM	<b>Technical Challenges of F-19 MRI in Humans and Animals</b> Marcus Couch, Ph.D. Hospital for Sick Children, Canada
9:00 – 9:20 AM	<b>Hyperpolarized and Inert Fluorinated Gas MRI of the Lungs and Xenon-129 Biosensor Molecular MRI</b> Mitchell Albert, Ph.D. Thunder Bay Regional Research Institute, Canada
9:20 – 9:35 AM	<b>Discussion</b>
9:35 – 9:50 AM	<b>Break</b>

### **Session XIII: Imaging Gas Exchange Moderator: John P. Mugler, Ph.D.**

9:50 – 10:10 AM	<b>Imaging Pulmonary Gas Transfer Using Hyperpolarized <math>^{129}\text{Xe}</math> MRI</b> Bastiaan Driehuys, Ph.D. Duke University
10:10 – 10:30 AM	<b>Hyperpolarized <math>^{129}\text{Xe}</math> and <math>^3\text{He}</math> MRI</b> Jim Wild, Ph.D. Sheffield University, United Kingdom
10:30 – 10:50 AM	<b>A New COPD Phenotype Discovered by Hyperpolarized Xenon-129 MRI</b> Y. Micheal Shim, M.D. University of Virginia
10:50 – 11:10 AM	<b>The <math>^{129}\text{Xe}</math> MRI Clinical Trials Consortium: A Route for Multi-site Trials</b> Jason Woods, Ph.D. Cincinnati Children's Hospital Medical Center



11:10 – 11:30 AM	<b>New Molecular Reporters for Hyperpolarized Xe-129 MRI</b> Ivan Dmochowski, Ph.D. University of Pennsylvania
11:30 – 11:50 AM	<b>Pulmonary Microstructure and Gas-exchange Function Evaluated by Hyperpolarized Xenon MRI</b> Xin Zhou, Ph.D. Chinese Academy of Sciences, China
11:50 AM – 12:10 PM	<b>NMR Hyperpolarization Techniques of Gases</b> Eduard Chekmenev, Ph.D. Vanderbilt University
12:10 – 12:20 PM	<b>Discussion</b>
12:20 – 1:10 PM	<b>Lunch</b>

**Session XIV: Graduate Student and Postdoctoral Presentations – Part III**  
**Moderator: Stephen Kadlecck, Ph.D.**

1:10 – 1:20 PM	<b>An Image Acquisition and Analysis Strategy for Spatial Comparison of Ventilation CT with <sup>3</sup>He and <sup>129</sup>Xe MRI</b> Bilal Tahir, M.S. Sheffield University, United Kingdom
1:20 – 1:30 PM	<b>Dissolved Phase Hyperpolarized Xenon-129 Pulmonary Imaging in the Presence of Gaseous Xenon Signal</b> Jeff Kammerman, B.S. University of Wisconsin
1:30 – 1:40 PM	<b>Introducing Preclinical In Vivo Hyperpolarized <sup>129</sup>Xe Lung Imaging to Cincinnati</b> Teckla Akinyi, B.S. Cincinnati Children's Hospital Medical Center
1:40 – 1:50 PM	<b>Pseudo-compliance Mapping of the Rat Lung Using Hyperpolarized <sup>129</sup>Xe Morphometry at Varying Pressures</b> Andras Lindenmaier, M.S. Hospital for Sick Children, Canada
1:50 – 2:00 PM	<b>Metabolic and Structural Imaging of Syngeneic and Allogeneic Rat Lung Transplantation</b> Sarmad Siddiqui, B.S. University of Pennsylvania
2:00 – 2:10 PM	<b>Investigating Metabolic Alterations During the Progression of Acute Lung Injury Using Hyperpolarized Carbon-13</b> Mehrdad Pourfathi, M.S. University of Pennsylvania
2:10 – 2:20 PM	<b>Predicting Treatment Response and Survival of Early-stage Non-small Cell Lung Cancer Patients Treated with Stereotactic Body Radiation Therapy Using Unsupervised Two-way Clustering of Radiomic Features</b> Hongming Li, Ph.D. University of Pennsylvania
2:20 – 2:30 PM	<b>Discussion</b>

**Session XV: Advances in Pulmonary Imaging Technology – Part II**  
**Moderator: Masaru Ishii, M.D., Ph.D.**

**2:30 – 2:50 PM**

**Respiratory Motion Correction in PET/CT and PET/MR**

Kris Thielemans, Ph.D.  
University College London, United Kingdom

**2:50 – 3:10 PM**

**An Open-source Framework for Multi-modal Pulmonary Image Analysis**

Nicholas J. Tustison, Ph.D.  
University of Virginia

**3:10 – 3:30 PM**

**Direct Repeated Measurements of Tissue Oxygen in Human Subjects to Guide Diagnosis and Treatment**

Harold M. Swartz, M.D., Ph.D.  
Dartmouth University

**3:30 – 3:50 PM**

**Optimization of Respiratory Drug Development by Means of Functional Respiratory Imaging**

Jan De Backer, Ph.D.  
FLUIDDA, Inc.

**3:50 – 4:00 PM**

**Discussion**

**4:00 – 4:10 PM**

**Final Remark**

Rahim R. Rizi, Ph.D.  
University of Pennsylvania