Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Historical perspectives on respiratory fluid dynamics and flow phenomena deep in the lung JOSUE SZNITMAN, Institute of Fluid Dynamics, ETH Zurich, AKIRA TSUDA, Harvard School of Public Health — Next year marks 30 years since the first review on pulmonary fluid dynamics was published (TJ Pedley, *Ann Rev Fluid Mech*, 1977). Since the early publications on flow resistance in airways (F Rohrer, Pflugers Arch, 1915), much research has been conducted to deepen our understanding on the role of flow convection in the lung. While many investigations have been aimed at elucidating the nature of airflow in the upper (nose, larynx) and conducting airways (trachea down to the 15^{th} bifurcation generation of the airway tree), comparatively little effort has dealt with airflow in the deeper regions of the lung, characterized by 300 million pulmonary alveoli providing gas exchange with blood. For very long, it has been argued that airflow velocities in the alveolar region are negligible due to a large increase in the total cross-sectional area at that level. This is still reflected today in medical teaching. However, in the last 20 years, new theories have tackled the experimental observation of convective mixing of inhaled particles deep in the lung. These theories suggest that convective airflow in the alveolar region is indeed relevant. In particular, alveolar flows are much more complex than previously thought and may exhibit properties of chaotic flows. Such discoveries have led to a small revolution in our common understanding of respiratory flows deep in the lung.

Josue Sznitman
Institute of Fluid Dynamics, ETH Zurich

Date submitted: 16 Nov 2006 Electronic form version 1.4