JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

FALL 2020 CEAFM VIRTUAL SEMINAR

"The (Un)known (Un)knowns of COVID-19 Transmission - A Fluid Dynamics Perspective"

Presented by Prof. Rajat Mittal

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& Johns Hopkins - University School of Medicine
Hosted by Charles Meneveau (JHU - MechE)

COVID-19 spread across the world with a speed and intensity that laid bare the limits in our understanding of the transmission pathways of such respiratory diseases. There is, however, an emerging consensus that airborne transmission constitutes an important mode for the spread of COVID-19. Each stage in this transmission pathway is mediated by complex flow phenomena, ranging from air-mucous interaction inside the respiratory tract, turbulence in the exhaled jet/ambient flow, to inhalation and deposition of these aerosols in the lungs. Inspired by the Drake Equation that provides a framework to estimate the seemingly inestimable probability of advanced extraterrestrial life, I propose a phenomenological model for estimating the risk of airborne transmission of a respiratory infection such as COVID-19. The model incorporates simple ideas from fluid dynamics with known factors involved in airborne transmission, and is designed to serve not only as a common basis for scientific inquiry across disciplinary boundaries, but to also be understandable by a broad audience outside science and academia. Given the rapidly evolving nature of the pandemic and the resurgence of infections in many communities, the importance of communicating infection risk across scientific disciplines, as well as to policy/decision makers, is more important than ever.

Rajat Mittal is Professor of Mechanical Engineering at the Johns Hopkins University (JHU) with a secondary appointment in the School of Medicine. He received the B. Tech. degree from the Indian Institute of Technology at Kanpur in 1989, and the Ph.D. degree in Applied Mechanics from The University of Illinois at Urbana-Champaign, in 1995. His research interests include fluid mechanics, computing, biomedical engineering, biofluids and flow control. He is the recipient of the 1996 Francois Frenkiel Award from the Division of Fluid Dynamics of the American Physical Society, and the 2006 Lewis Moody Award from the American Society of Mechanical Engineers. He is a Fellow of American Society of Mechanical Engineers and the American Physical Society, and an Associate Fellow of the American Institute of Aeronautics and Astronautics. He is associate editor of the Journal of Computational Physics, Frontiers of Computational Physiology and Medicine, and the Journal of Experimental Biology.

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