Abstract Submitted
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**Pathogen clearance in the respiratory system and other self-cleaning surfaces**[1] ARNOLD MATHIJSSEN, University of Pennsylvania, FRANCISCA GUZMAN-LASTRA, Universidad de Chile, HARTMUT LOEWEN, Heinrich-Heine-Universitaet Duesseldorf — Our airways are continuously exposed to potentially harmful particles like dust and viruses. The first line of defence against these pathogens is a network of millions of cilia, whip-like organelles that pump flows by beating over a thousand times per minute. In this talk, I will discuss the connection between local cilia architecture and the topology of the flows they generate. We image the mouse airway from the sub-cellular (nm) to the organ scales (mm), characterising quantitatively its ciliary arrangement and the resulting flows. Interestingly, we find that disorder in the ciliary alignment can actually be beneficial for this pathogen clearance. More generally, I would also like to discuss how systems can be driven out of equilibrium by such active carpets. Combining techniques from statistical and fluid mechanics, I will demonstrate how we can derive the diffusivity of particles near an active carpet, and how we can generalise Fick's laws to describe their non-equilibrium transport. These results may be used for new self-cleaning materials, much like our airways.

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