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Collective motion of motile cilia: from human airways to model systems PIETRO CICUTA, LUIGI FERIANI, MAURIZIO CHIOCCIOLI, JURIJ KOTAR, University of Cambridge — Mammalian airways are a fantastic playground of nonlinear phenomena, from the function of individual active filaments, to the emerging collective behaviour, to the rheology of the mucus solution surrounding cilia. We have been investigating the fundamental physics of this system through a variety of model system approaches, both experimental and computational. In the last year we have started measurements on living human cells, observing cilia shape during beating, and measuring speed and coherence of the collective dynamics. We report on significant differences in the collective motion in ciliated cell carpets from a variety of diseases, and we attempt to reconcile the collective dynamical phenotypes to the properties of individual filaments and the mechanics of the environment.

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