## Abstract Submitted for the DPP20 Meeting of The American Physical Society

Puff trains in speaking produce long-range turbulent jet-like transport potentially relevant to asymptomatic spreading of viruses<sup>1</sup> HOWARD STONE, Mechanical and Aerospace Engineering, Princeton Univ., MANOUK ABKARIAN, Centre de Biochimie Structurale, CNRS, Univ. Montpellier, France, SIMON MENDEZ, Institut Montpellierain Alexander Grothendieck, CNRS, Univ. Montpellier, France, NAN XUE, FAN YANG, Mechanical and Aerospace Engineering, Princeton Univ. — Droplet generation and transport during coughing and sneezing has been studied for decades to characterize disease transmission by symptomatic individuals. Nevertheless, reports document that asymptomatic and presymptomatic individuals contribute to the spread of COVID-19, e.g. during social interactions. Droplet emission occurs during speech, yet there are few quantitative studies of the flows that provide the transport mechanism. We analyze flows during breathing and speaking, including linguistic features, using order-of-magnitudes estimates, numerical simulations, and laboratory experiments. We show how plosive sounds like 'P' are associated with vortical structures, producing transport over half a meter in a split second. When produced individually, puffs decay over a meter, traveling in time t a distance  $L \sim t^{1/4}$ , and mix with the slower environmental circulation. In contrast, material exhaled over time scales longer than a few seconds, characteristic of speech, which is effectively a train of puffs, forms a conical turbulent jet with a scaling law  $L \sim t^{1/2}$ . This work will inform thinking about aerosol transport in disease transmission for humans and animals, and offer understanding of linguistic aerodynamics.

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