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Fluid Friction and Fungal Spore Ejection JOERG FRITZ, AGNESE SEMINARA, School of Engineering and Applied Sciences, Harvard University, MARCUS ROPER, Department of Mathematics, University of California, Berkeley, ANNE PRINGLE, Department of Organismal Biology, Harvard University, MICHAEL BRENNER, School of Engineering and Applied Sciences, Harvard University — A wide range of fungal species in the phylum Ascomycota uses the forcible ejection of microscopic spores to disperse and to cover new territory, triggered by the breakdown of osmolytes in the sack containing the spores (the ascus). The spores experience very high aerodynamic drag due to their small size and need to attain high velocities to leave the boundary layer of still air around the fruiting body. Here we address the efficiency of conversion of osmotic pressure to the kinetic energy of the spore, and in particular its dependence on the design of the ascus and the hole (the so-called apical ring) from where the spores leave the ascus. We present a fluid mechanical model of the ejection process, which predicts that the hole the apical ring should have specific properties, in order to minimize frictional and pressure losses and maximize the ejection velocity. We compare these predictions to measurements of apical ring properties across the phylum.

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