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Killing to Fluctuate, or: How Death and Reproduction Drive a Fluctuation-Response Relation in Biofilms ARBEN KALZIQI, PETER YUNKER, JACOB THOMAS, Georgia Institute of Technology — Unlike equilibrium atomic solids, biofilms do not experience significant thermal fluctuations at the constituent level. However, cells inside the biofilm stochastically die and reproduce, provoking a mechanical response. We investigate the mechanical response of biofilms to the death and reproduction of cells by measuring surface-height fluctuations of biofilms with two mutual predator strains of *Vibrio cholerae* which kill one another on contact via the Type VI Secretion System. Biofilm surface topography is measured in the homeostatic limit, wherein cell division and death occur at roughly the same rate, via white light interferometry. Although biofilms are far from equilibrium systems, measured height correlation functions line up with expectations from a generalized fluctuation-response relation derived from replication and death events, as predicted by Risler et al. (PRL 2015). Using genetically modified strains of *V. cholerae* which cannot kill, we demonstrate that extracted effective temperatures increase with the amount of death and reproduction. Thus, high-precision measurement of surface topography reveals the physical consequences of death and reproduction within a biofilm, providing a new approach to studying interactions between bacteria and cells.

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