Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Hydraulic fracture and resilience of epithelial monolayers under stretch MARINO ARROYO, Univ Politecnica de Catalunya, ALESSANDRO LUCANTONIO, GIOVANNI NOSELLI, SISSAInternational School for Advanced Studies, LAURA CASARES, Institute for Bioengineering of Catalonia (IBEC) / Univ Politecnica de Catalunya, ANTONIO DESIMONE, SISSAInternational School for Advanced Studies, XAVIER TREPAT, Institute for Bioengineering of Catalonia (IBEC) — Epithelial monolayers are very simple and prevalent tissues. Their functions include delimiting distinct physicochemical containers and protecting us from pathogens. Epithelial fracture disrupts the mechanical integrity of this barrier, and hence compromises these functions. Here, we show that in addition to the conventional fracture resulting from excessive tissue tension, epithelia can hydraulically fracture under stretch as a result of the poroelastic nature of the matrix [1]. We will provide experimental evidence of this counterintuitive mechanism of fracture, in which cracks appear under compression. Intriguingly, unlike tensional fracture, which is localized and catastrophic, hydraulic epithelial fracture is distributed and reversible. We will also describe the active mechanisms responsible for crack healing, and the physical principles by which the poroelastic matrix contributes to this resilient behavior [2]. [1] Casares et al., Nature Materials, 14, 343-351 (2015) [2] Lucantonio et al., Physical Review Letters, 115, 188105 (2015)

Marino Arroyo
Univ Politecnica de Catalunya

Date submitted: 05 Nov 2015 Electronic form version 1.4