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Towards a Fluidic Excitable System MIGUEL RUIZ-GARCIA, ELENI KATIFORI, University of Pennsylvania, ALEJANDRO MARTINEZ-CALVO, Universidad Carlos III de Madrid — Excitable systems occur frequently in both living and engineering systems. Forest fires, the propagation of axon potentials or the cAMP waves of the amoebae Dictyostelium, are familiar yet still fascinating systems that exhibit excitability. Previous works have shown that topologically complex networks interconnecting explicitly oscillatory or excitable elements that are subject to a refractory time after each excitation, candisplay rich emerging dynamics. But what if such excitable elements are not (presumably) available? In this talk, we propose a realization of a fluidic resistor with non-monotonic differential resistance, and discuss how a connected series of such fluidic elements could result in excitatory-like behavior, without an explicit refractory time.In the absence of any time dependence in thepressure input and output the system exhibits emerging dynamics in the form of self-sustained waves, which travel through the tubes.Using finite element hydrodynamic simulations we explore the behavior of the non-linear fluidic element, show internal accumulation and depletion of volume in the tube, akin to a fluidic capacitance, and a long range volume pressure coupling, all necessary components for the excitable behavior of the fluidic system.

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