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Time-energy correlations as a hallmark of different branching processes

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Several biological and natural systems appear to operate close to a critical point, as evidenced by the absence of a characteristic size in the phenomenon. Indeed, the existence of power law distributions has been detected in several contexts, as different as earthquakes, solar flares or spontaneous brain activity, and, surprisingly, with similar scaling behaviour. We propose that the specific features of each phenomenon are imbedded in the temporal organization of events in time. A detailed analysis of time-energy correlations detrending statistical noise is able to enlighten the difference between the physical mechanisms controlling different phenomena, as earthquakes, solar flares or neuronal avalanches.

Primary author: DE ARCANGELIS, Lucilla (S)

Presenter: DE ARCANGELIS, Lucilla (S)

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