

Abstract Submitted
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The rise and fall of social communities: Cascades of followers triggered by innovators YANQING HU, Levich Institute and Physics Department, City College of New York, New York, New York 10031, USA, SHLOMO HAVLIN, Minerva Center and Physics Department, Bar-Ilan University, Ramat Gan 52900, Israel, HERNAN MAKSE, Levich Institute and Physics Department, City College of New York, New York, New York 10031, USA — New scientific ideas as well as key political messages, consumer products, advertisement strategies and art trends are originally adopted by a small number of pioneers who innovate and develop the “new ideas”. When these innovators migrate to develop the novel idea, their former social network gradually weakens its grips as followers migrate too. As a result, an internal “cascade of followers” starts immediately thereafter speeding up the extinction of the entire original network. A fundamental problem in network theory is to determine the minimum number of pioneers that, upon leaving, will disintegrate their social network. Here, we first employ empirical analyses of collaboration networks of scientists to show that these communities are extremely fragile with regard to the departure of a few pioneers. This process can be mapped out on a percolation model in a correlated graph crucially augmented with outgoing “influence links”. Analytical solutions predict phase transitions, either abrupt or continuous, where networks are disintegrated through cascades of followers as in the empirical data. The theory provides a framework to predict the vulnerability of a large class of networks containing influence links ranging from social and infrastructure networks to financial systems and markets.

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