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Complete trails of social network evolution: The past 10 years of complex network research DEOKJAE LEE, Seoul National University, KWANG-IL GOH, Korea University, BYUNGNAM KAHNG, DOOCHUL KIM, Seoul National University — During the last 10 years since the publication of pioneering papers on small-world and scale-free networks, more than 5,500 distinct researchers produced more than 4,000 research papers on complex networks, setting an unprecedented example in the history of science. Based on the dataset of published papers on complex networks during the years 1998–2007, here we study the complete evolution of the co-authorship network in network science. This dataset allows us to study the complete trail of social network evolution from the inception, in particular in the early transient stage, which has not been addressed empirically in previous studies. We find that distinct patterns in network topology emerge during the evolution: A fractal, tree-like giant cluster forms in the early stage through the cluster aggregation process, akin to the pattern near the percolation point, then followed by the entanglement process due to appearance of large-scale loops in later times. This evolution pattern is also observed in the co-authorship network on string theory. The giant cluster is found to be dynamic yet robust upon removal of obsolete inactive links, providing the core part underneath the further developed network. Finally, based on the empirical observations, we introduce a network evolution model, successfully reproducing the observed patterns.

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