LETTERS

Random Copying and Cultural Evolution

Although network theory has much to offer, the mathematical study of collective human behavior is older and richer [e.g., (1-4)] than Albert-László Barabási suggests in his Perspective "Network theory--the emergence of the creative enterprise" (29 Apr., p. 639). Barabási rightly makes the point that, rather than studying static networks, the time has come to study how social networks evolve in time, as some have already begun to do (5-7). In laying out this objective, however, Barabási curiously does not include evolutionary theory, which is specifically the study of how the frequencies of variants change over time. In fact, Cavalli-Sforza and Feldman (1) demonstrated decades ago how the mathematical theory of population genetics has all the tools to study change in human behavior over time. A powerful tool is the neutral theory of random genetic drift (8), by which a population of individuals copy variants from each other, except for a small fraction in each time step who invent a new variant (9-11). Many of the phenomena addressed by network theory are also elegantly explained by random copying (7, 8).

As a null hypothesis, the random-copying model is simpler than network theory. Are Web links, Hollywood actors, and scientific collaborators really nodes in a network, or are they just ideas that are copied among individuals? In the Barabási-Albert model (12), "preferential attachment" is an imposed rule, whereas in the random-copying model, the "rich get richer" effect emerges naturally because the more popular a variant is, the more likely it will be copied again, becoming even more popular. Time-dependent difficulties for the basic preferential attachment network model (13), such as quick success by new nodes and rapidly changing networks, are not a problem in the random-copying model, by which any new variant stands a small chance of becoming highly popular (like a network "hub"), and the network of who copied whom completely changes at every time step. Given these advantages, combined with decades of research establishing neutral theory (14), network researchers should broaden their connections outside their own emerging and exciting field.

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