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Gossip: More than just trash talk

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Think gossip is just trash talk? Think again. A new study shows that gossip influences behavior, fosters cooperation, and increases group affiliation.

"Believe nothing you hear, and only one-half of what you see" wrote Edgar Allen Poe in *The System of Doctor Tarr and Professor Fether*. This counsel, given to an unnamed narrator in Poe's short story, advises outright distrust of gossip and skepticism even for direct experience. Such advice aligns with our intuitions that gossip is unreliable; our behavior should be guided by careful scrutiny of the world around us. A new study reported in this issue of *Current Biology* by Eshin Jolly and Luke J. Chang[1] challenges this intuitive understanding by showing that gossip provides useful information about social others, that people rely more on gossip than direct observation, and that gossip facilitates increased cooperation and social affinity.

Gossip, and its functions, has been variously defined over the years. Gossip has been conceptualized as a source of information transfer, a mechanism for communicating group values, a way to signal group affiliation, a tool for indirectly attacking rivals, and a self-interested strategy for marshalling informational resources[2]. A common theme among these definitions is that gossip involves the sharing of negative information about absent social others.

Alternative conceptualizations posit more prosocial functions for gossip. Such accounts treat gossip as a tool for social sanction that fosters group cooperation[3,4], a means of vicarious social learning[5], or an adaptation that fosters social connections and relationships[6]. Without taking away from the merits of these claims, Jolly and Chang[1] argue that the time has come for a broader and more expansive conceptualization of gossip. To that end, their study investigates three fundamental questions: under what circumstances does gossip emerge; how does gossip about someone else shape our own behavior; and how does gossip influence our evaluation of social others?

Answering these questions requires a task that is high in experimental control

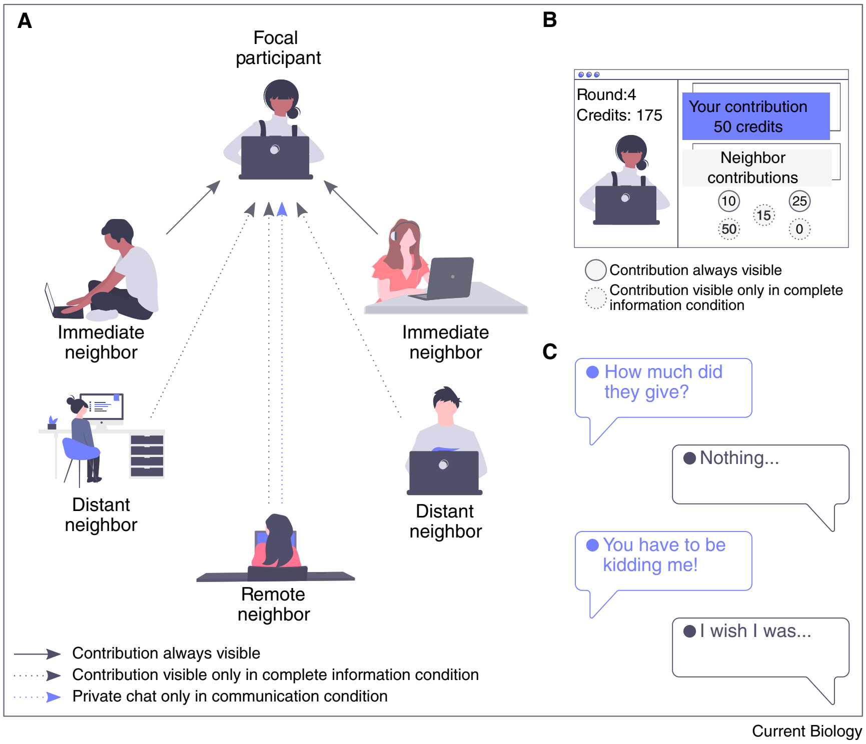

Figure 1. Conceptual schematic of the experimental design employed by Jolly and Chang[1].
(A) Six participants were organized in a ring network. From the focal participant's perspective, information about distant and remote neighbor behavior, and the ability to communicate with the remote neighbor, varied by experimental condition. (B) All six participants simultaneously completed 10 rounds of a public goods game. Focal participants in the complete information condition could see the contribution of all neighbors in the network, while focal participants in the incomplete information condition could only see the contribution of immediate neighbors in the network. (C) Focal participants in the communication condition were able to exchange two 140 character text messages with their remote neighbor. Importantly, distant neighbors for the focal participant were immediate neighbors for the remote participant. This means that the remote participant could observe and discuss behavior that was unobservable for focal participants in the incomplete information condition.

but also allows for naturalistic behavior. Jolly and Chang[1] developed an elegant experimental design in which six participants simultaneously completed ten rounds of a public-goods game (Figure 1A). Each participant was allocated a bank of credits and, for each round, participants were asked how many credits they would keep for themselves and how many credits they would contribute to the group (Figure 1B). The total group contribution was increased by 50% and then redistributed equally to all participants, thereby ensuring that participants were incentivised to make contributions to the group while also allowing free-rider strategies to emerge.

In order to test their questions about gossip, Jolly and Chang[1] randomly assigned participants to one of four experimental conditions (Figure 1A). In the complete information condition, participants could observe the behavior of all other partners in the ring network. In the incomplete information condition, the behavior of just two immediate neighbors in the network was visible. This was crossed with the capacity for gossip such that some participants could communicate with a remote neighbor during the game whereas others could not communicate (Figure 1C).

Jolly and Chang[1] hypothesized that gossip should be higher when the behavior of others is unobservable. Therefore, gossip should be higher in the incomplete information condition relative to the complete information condition. To test this question, human annotators labeled message content for each round and the overall proportion of messages for each label was calculated. As expected, the proportion of messages containing gossip (where participants discussed the behavior of others) was highest in the complete information condition (21.7%) relative to the incomplete information condition (14.9%). Interestingly, participants engaged in substantially more idle 'chit-chat' — for example, getting to know one-another, telling jokes — in the complete (29.1%) rather than incomplete (26.8%) conditions (Figure 2). Together, these findings demonstrate that, when the behavior of others is unobservable, people rely on gossip to learn about what others are doing.

Jolly and Chang[1] also hypothesized that gossip influences behavior. To test this hypothesis, they constructed a time-lagged model where the past contribution behavior of immediate, distant, and remote neighbors was used to explain the focal participant's contribution behavior on a future round of the public goods game. If gossip influences contribution behavior, then for incomplete information conditions, the past behavior of unobservable neighbors should, nevertheless, influence a focal participant's behavior. This is exactly what they found. When communication is available (*versus* when it is unavailable), the past (and unobservable) contribution behavior of distant and remote neighbors strongly influenced the focal participant's future contributions. Surprisingly, the unobservable behavior of distant and remote neighbors more strongly influenced the future behavior of the focal participant compared to the observable behavior of immediate neighbors when communication was available. This pattern was reversed when communication was unavailable. Moreover, participants had more similar affinity ratings when communication was possible, and these affinity ratings were associated with larger contributions to the public goods game.

A natural follow-up question is: what is the function of gossip when the contribution behavior of distant and remote players is observable? To test this question, Jolly and Chang[1] examined how observable past contribution behavior of distant and remote neighbors influenced focal participant future contribution behavior when communication was available or unavailable. They found that the remote neighbor's past contribution behavior strongly influenced focal

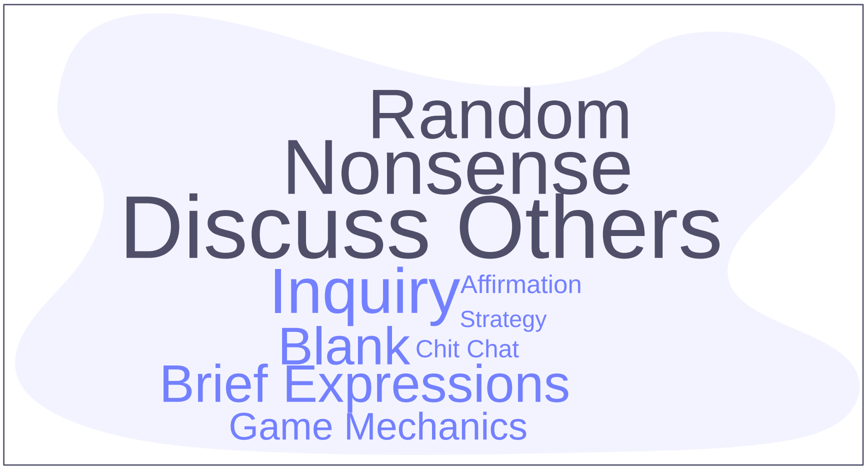

Figure 2. A comparison word cloud shows that gossip was more common in the incomplete information condition.
Jolly and Chang[1] compared the frequency of different communication topics for the complete (lightly colored words) and incomplete (darkly colored words) information conditions. Word size is determined by the magnitude of the difference for each topic between conditions; smaller words indicate smaller differences and larger words indicate larger differences between the incomplete and complete information conditions. Results show that the "discuss others" (or gossip) topic was most common in the incomplete information condition.

participant future behavior, but only when communication was available. When communication was unavailable, the past contribution of immediate neighbors most strongly influenced focal participant future behavior. Here again, it seems that the capacity for communication influences affinity. Participants had more similar affinity ratings when communication was possible, although there was a weaker interaction effect for communication and affinity on contribution to the public goods game.

Finally, Jolly and Chang[1] examined the role of gossip in facilitating group cooperation. To do this, they examined participant contributions by experimental condition. The average group contribution declined less and participants contributed more in games with gossip than without. Surprisingly, they also found that more gossip was associated with larger contributions, and this pattern existed for both the complete and incomplete information conditions. However, and as is commonly observed in public goods scenarios, not everyone contributed equally. Interestingly however, Jolly and Chang[1] found that gossip, rather than forms of punishment[7,8], was sufficient to shift a subset of participants to become more cooperative.

In 1948, Harold Lasswell[9] described the scientific study of communication as systematic inquiry into answering "who, says what, in which channel, to whom, with what effect?" Jolly and Chang's[1] path breaking research is well-situated within this tradition. In a semi-naturalistic task, these authors simultaneously account for what is said and with what effect, while carefully controlling everything else. The end result is a study that expands our understanding of the function of gossip beyond the narrower definitions that previously existed[2–6]. Specifically, Jolly and Chang[1] show that gossip is more common when information about others is incomplete, influences prosocial behavior (particularly when information about others is unavailable), leads to stronger feelings of group affiliation, and fosters collaboration within groups.

Jolly and Chang's[1] research also raises tantalizing new questions that lie at the intersection of psychology, anthropology, and communication research. Their results are contingent on the fact that participants relied on gossip. Why is it that people tend to believe others, even when deception is easy[10]? Why are some messages reliably honest[11–13], and how do channel characteristics interact with message source motivations to influence message receiver willingness to believe and act on certain information[14–16]? How do new technologies such as the internet and social networking sites shape the way humans strategically use gossip[17]? Jolly and Chang's[1] efforts unlock new avenues for research within these long-running traditions. As an added bonus, this work provides a behavioral and analytical paradigm that is capable of proffering important insights into gossip, and human communication more broadly.

In sum, Jolly and Chang's[1] study demonstrates that the unnamed narrator in Poe's short story was wrong. People do believe what they hear, and sometimes their behavior is more strongly influenced by what they hear, rather than what they see.

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Ecology: E-rat-ication to restore reefs

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Invasive species often drive native species to local extinction. A new study shows that removing invasive rats from tropical islands fosters recovery of native seabirds. Rising seabird populations reestablish key cross-ecosystem nutrient subsidies, reconnecting oceanic, island, and coral reef ecosystems.

Invasive species cause significant ecological and economic damage to ecosystems worldwide[1]. Threats from invasive species are often most severe in island ecosystems where they can lead to extinction of endemic plants and animals, loss of habitat, disruption of ecosystem processes and impact to critical ecosystem services[2]. Targeted removal of the most noxious invasive species such as rats, goats and pigs has become a key conservation intervention for helping revive endangered species and restore island ecosystems[3,4]. While most invasive species eradications have occurred on temperate islands[5], in this issue of *Current Biology*, Cassandra Benkwitt, Nicholas Graham and colleagues[6] show that removal of invasive rats from tropical islands helps revive populations of seabirds and restore key nutrient subsidies to these islands that ultimately flow out to coral reef ecosystems.

Invasive rats (Figure 1) have driven seabirds to extirpation on many islands worldwide[7], endangering many seabird species and also impacting key ecosystem functions. Seabirds represent a unique link between land and ocean. They forage for fish at sea and return to land to roost, nest and poop. This conveyor belt of nutrients from the ocean to land in the form of seabird guano, often transferring marine-derived nutrients from hundreds of kilometers away, turns such islands into nutrient hotspots in what are often nutrient-poor parts of the ocean[8]. The key limiting nutrients (nitrogen and phosphorus) in seabird guano shape the ecology of these island ecosystems, impacting species diversity, food webs and ecosystem processes in terrestrial and coastal marine ecosystems[8,9]. The deposition of guano by seabirds has even shaped human behavior at the global scale, driving maritime exploration and colonization of islands worldwide in search of access to key sources of nutrients important to human societies[10].

However, the negative impact of invasive species on seabird populations can disrupt these nutrient subsidies and dramatically impact ecosystem function both on land and in adjacent coastal ecosystems[11,12]. In turn, the eradication of invasive species from islands could have far-reaching effects on both terrestrial and marine ecosystems as seabird populations recover. Benkwitt and colleagues[6] take advantage of island-wide removals of invasive rats in the Indian Ocean to show that after eradication nutrient subsidies from rising seabird populations increase and cascade throughout both terrestrial and marine ecosystems. Not surprisingly, the eradication of rats, which feed on the eggs and young of seabirds, led to increases in seabird populations. More seabirds mean more guano, with islands where rats were eradicated seeing a 13-fold increase in seabird-derived nutrients compared with islands where rats remained.

The signature of these nutrients was clearly visible (via stable isotope analysis) in terrestrial soils and plants, meaning the seabird-derived nutrients were being incorporated into different components of the terrestrial ecosystem. Importantly, those seabird-derived nutrients ultimately moved into the nearshore coastal environment, with the stable isotope signal of seabird-derived nutrients being detectable up to 300 m offshore of the islands where seabirds were recovering. Not only were these nutrients detectable in algae that absorb the nutrients from the water column, but they were also detectable in the herbivorous fishes that eat algae, showing that the nutrients from seabird guano were trickling through the food web of nearshore reef ecosystems.

One of the reasons the results of Benkwitt and colleagues[6] are exciting is that the reestablishment of key nutrient subsidies from seabirds could have a network of wide ranging effects on nearby coral reef ecosystems (Figure 1). For example, corals living near islands with