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Why Heroism Exists

Evolutionary Perspectives on Extreme Helping

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On June 17, 2014, thirteen-year-old Robert Pritchard Junior rushed into a burning mobile home to rescue a six-year-old girl from being engulfed by the flames. Almost a year earlier, Christopher Ihle saved an eighty-four-year-old male and his seventy-eight-year-old wife from being struck by a train. A year prior to this incident, Kyle Hardman attempted to save three men and two children from drowning in the Mississippi River. Pritchard Junior, Ihle, and Hardman are recipients of the prestigious Carnegie Medal. These heroes were awarded their medals for voluntarily and knowingly risking their lives to attempt to save others. Why would anyone do such a thing? Why would one incur a cost—such as risk their life—to benefit others? Why would anyone be a hero?

From an evolutionary perspective, incurring any such costs appears puzzling at first glance. Natural selection favors traits that increase the propagation of one's genetic material into future generations, and it ruthlessly eliminates any costly traits that provide no net reproductive advantage. This logic prompts the following crucial questions: do heroes receive any benefits that counteract the costs of their actions (thus providing a net selective advantage for heroic traits), and if so, what is the nature of those benefits?

Evolutionary explanations solve the puzzle of prosociality (i.e., behaviors that involve benefiting others) by focusing on the inclusive fitness benefits (i.e., the survival and reproduction of one's offspring and the offspring of close genetic relatives) for the prosocial individual. For example, kin selection theory offers a strong evolutionary explanation for prosociality directed towards kin (Hamilton, 1963, 1964), because the personal fitness costs of providing such help are compensated by fitness benefits to kin (i.e., the survival and reproduction of copies of our genes in other bodies). Similarly, costly signaling theory (Zahavi, 1990, 1995; Zahavi & Zahavi, 1997) suggests that extreme forms of prosociality, such as heroism, might have evolved because heroes are able to gain elevated status for their remarkable actions, which in turn allows them access to previously unattainable social benefits.

Although prosocial individuals may be acting in ways to increase their inclusive fitness, they are not necessarily conscious of it. That is, people do not need to be aware of the link between prosociality and fitness to engage in these actions, any more than they need to think about their inclusive fitness every time they have sex, eat, sleep, or defecate. Self-sacrifice, cooperative sentiments, and empathy are *proximate mechanisms*, which motivate helpful behaviors within an individual to achieve the *ultimate function* of increasing the actor's survival and reproduction (proximate and ultimate causes are reviewed in Tinbergen, 1963; also see Scott-Phillips et al., 2011).

Throughout this chapter, we will address the evolutionary functions (ultimate causes) of being a hero (actor-side) and distinguishing someone as a hero (judger-side). We specifically take note of the observers (also termed "judges") because these individuals play a crucial role in determining who a hero is and what kinds of status benefits one receives for their heroism. These two perspectives—the hero's and the judge's—are both necessary to explain why heroism exists. We begin by reviewing some general evolutionary theories of "typical" prosociality, or what biologists would call theories of cooperation. We then discuss how these and other theories can be used to explain extreme prosociality such as heroism. But, before we attempt to explain the existence of heroism through an evolutionary lens, we must first provide a working definition of heroism.

What Is a Hero?

Heroism is an *extreme* form of prosociality, a category of behavior that involves benefiting another.[1] By definition, "typical" prosociality involves the actor delivering *average*—or *expected*—levels of benefits to others. Here we define heroes as those who incur costs (e.g., risk of injury or death; or significant sacrifices such as time, money, or other forms of personal loss) to deliver *greater-than-expected* benefits to others (Baumard & Boyer, 2013). That is, among many actors who engage in behaviors of a given cost, heroes are those who deliver *many more* benefits to others. Typically these costs are incurred by the hero without certainty and/or negotiated expectation of direct future rewards.

There are various types of heroes. Prototypical heroes are characterized by physical feats, bravery, and high risks of serious injury or death, such as war heroes or individuals who save others from peril. Folklore heroes such as Superman and Batman are deemed heroic for similar reasons: Their (fictive) willingness and superior ability to incur potentially high costs (e.g., deadly fights with various villains) to save others from danger and threat. Much like these fictive heroes, many may view famous athletes as heroic. Sports heroes gain status because they incur similar costs to other players but deliver greater-than-expected benefits (i.e., wins and entertainment).

Moving beyond prototypical heroism, some people may be deemed heroic because of their ability to offer greater-than-expected benefits in other ways. Heroic fictional detective Sherlock Holmes, for example, did not usually incur physical costs to save others. Instead he used superior reasoning and logical thinking to solve crimes and save lives. Others may even be deemed heroic because of incidental consequences of overtly self-beneficial acts. For example, vigilance may be primarily motivated by concern for protecting oneself and one's family from enemies, predators, or other threats. If such vigilance incidentally provides major protection benefits to others in the community, they may regard the watchman as a hero.

This list of hero-types is not exhaustive, but hopefully illustrates the idea that many different types of acts involve a delivery of greater-than-expected benefits to another, hence meeting our definition of heroism. Our definition of heroism may not perfectly map on to definitions used by others, but it does heavily overlap with conventional usage of the term. At the least, our definition is tractable, allowing us to offer useful evolutionary-minded insights into the heroism phenomenon. We invite readers to substitute their own term for the phenomenon we are examining if our definition does not fit their understanding of heroism.

Now that we have defined heroism, we can begin examining this phenomenon in greater detail. Our first line of inquiry answers the following question: If heroes are people who deliver many more benefits than would normally be expected, how much helping is normally expected of people? The answer to this question is a necessary first step to explaining the persistence of heroism, and will be addressed in the following section.

Expected Levels of Helping

Prosocial sentiments (e.g., feelings, attitudes) can evolve when providing help causes helpers to receive benefits that outweigh the costs of helping, on average. By using evolutionary theory to identify what kind of benefits helpers receive under normal circumstances, we can make predictions about the normal level of helping (i.e., the expected level of benefit-conferral). In this section, we focus on four categories of help by which benefits can accrue to helpers or their genes:

1 help directed towards close kin who share copies of the same genes (kin selection theory: Hamilton, 1963, 1964);
2 help that is exchanged reciprocally between individuals or within groups (reciprocity: Nowak & Sigmund, 2005; Trivers, 1971);
3 help towards recipients in whom one has vested interests due to interdependence or shared fates (Brown & Brown, 2006; Roberts, 2005; Tooby & Cosmides, 1996); and
4 help that evades punishment (Yamagishi, 1986).

Kin Selection

Legendary biologist J. B. S. Haldane famously quipped that he would willingly "jump into the river to save two brothers or eight cousins." Why? Kin selection (Hamilton, 1964) is a form of natural selection whereby costly helping to kin can evolve if the fitness costs to the helper are less than the fitness benefits to the recipient, discounted by the likelihood of the two sharing rare genes. This applies to all forms of helping, from help that incurs minor costs to extreme costs like sacrificing one's life. Haldane's cousins were more likely to share his genes than strangers, and his brothers even more likely, providing an inclusive fitness rationale for his (hypothetical) extreme sacrifices. Honeybees famously sacrifice their own lives for their hive-mates and their queen, all of whom are close relatives (e.g., sisters). In humans, it is now well established that help is preferentially directed towards kin (Mateo, 2015), particularly in high-cost situations (Stewart-Williams, 2007, 2008).

Heroism, as presented in this chapter, is going *beyond* the expected benefits, and as described above, kin are expected to help kin. We expect that people will help kin in need, especially in high-cost, hero-esque contexts, such as parents rescuing their children from a house fire. Parent rescuers receive inclusive fitness benefits that non-kin rescuers do not. Accordingly, extreme helping directed toward kin are often not viewed as heroic—or at least the bar is much higher for help towards kin to be called "heroic." Notably, the Carnegie Medal does not recognize individuals who helped save members of their immediate family, except in cases of outstanding heroism where the rescuer loses his or her life or is severely injured. Conversely, when heroic feats are directed towards a non-relative (i.e., when the hero receives no kin-selected benefits), they are widely recognized.

Reciprocity

Reciprocal interactions are an integral part of our daily life. In repeated interactions, such as friendships, we exchange help for mutual benefit (e.g., Barclay, 2013, 2016; Noë & Hammerstein, 1994, 1995). Prosocial actions can prompt two kinds of reciprocal interactions:

1 help that is directly returned by the person we previously helped ("direct reciprocity": Axelrod, 1984; Trivers, 1971); or
2 help that allows us to establish a good reputation such that benefits are returned indirectly by third-party observers ("indirect reciprocity": Nowak & Sigmund, 2005).

Experience with such interactions sets the expectation that once you help someone, benefits will eventually be returned either directly or indirectly. So, if you have been helped, the expectation is that you will return the favor. For instance, if a co-worker buys you coffee or sweets, or a neighbor helps you with your groceries, there may be an expectation that you should return the favor (or a different favor) at a later time. If this is people's expectation—conscious or otherwise—then people will not consider it heroic when people help each other at normal levels within an established relationship. Even large amounts of help are not considered heroic if they are close to the range of what is normally given within the relationship (direct relationship) or within the society more generally (indirect reciprocity).

Vested Interest

Sometimes helpers directly benefit from helping someone because they have a stake or vested interest in the recipient's welfare. We can think of many instances of this: giving coffee to your tired driver so he does not crash, participating in a collective defense of your own group, and making a donation to a local politician who is fighting a plan to build a polluting factory in your neighborhood. In these cases, the helper has a "stake" in the well-being of the beneficiary. When two or more people are interdependent, we'd expect helpers to deliver benefits to the recipient because the helper's welfare is necessarily linked to the recipient's (e.g., Brown & Brown, 2006; Roberts, 2005; Tooby & Cosmides, 1996). In such cases, the costs of providing help are less than the fitness benefits received, and we can expect that benefits would be directed towards those whose well-being is valuable to the helper. These vested interests can explain even large delivery of benefits to other people, if the donor has a correspondingly large stake in the recipient(s), such as when health insurance companies in the United States donated millions of dollars to politicians who opposed universal care. Hero judgments are sensitive to such vested interests in others: people who are perceived to benefit directly by helping others tend to be rated as less heroic by observers (Lin-Healy & Small, 2013).

Punishment

Not all help is freely provided to others. Punishment can be used to motivate continual compliance with cooperative expectations. For instance, laboratory experiments have consistently established that people within groups contribute more money to a fund that benefits everyone in the group (the fund is a "public good") if a system is available to sanction those who do not contribute (for a review, see Balliet, Mulder, & Van Lange, 2011). In the real world, community-owned public goods resources are best sustained when the community can impose sanctions on those who overuse the resource or who do not pay for its maintenance (Ostrom, 1990). Other real-world examples of contributing to public goods include taking your turn at completing household chores or, on a more extreme scale, billionaires paying millions in taxes to avoid tax evasion charges. In all these examples, imposing costs on selfish individuals helps maintain cooperation because the benefits for conforming exceed the costs of receiving punishment. Thus, sanctioning systems set others' expectations of compliance: benefits are expected to be delivered when failure to comply can lead to punishment.

How does punishment relate to heroism? Well, if one delivers the amount of benefits necessary to evade punishment, such behavior would not be considered heroic. Such helping is expected because evading punishment could save oneself from severe fitness costs, such as losing one's good reputation, being shunned or ostracized by one's community, and/or receiving high financial fines. So, given the potentially high fitness costs of *not* helping, help in such circumstances do not generally fit most people's conception of heroism.

Exceeding Expected Levels of Helping: Why Be a Hero?

We can predict others' helping based on kinship, reciprocity, vested interests, and avoidance of punishment—these all set our expectations of how much person A might help person B. But why might someone *exceed* these expectations? That is, why might someone perform heroic acts by incurring costs to deliver higher-than-expected benefits to others? Why—in an evolutionary sense—do heroes exist? One answer comes from costly signaling theory (Zahavi, 1975, 1990, 1995; Zahavi & Zahavi, 1997).

Costly signaling theory relies on the notion that observable displays (i.e., signals) are associated with unobservable qualities (i.e., one's underlying genetic or phenotypic characteristics; Zahavi, 1975, 1990, 1995; Zahavi & Zahavi, 1997). Accordingly, people can use cooperative behavior as signals to communicate their underlying qualities to others. For example, the hero risking his life to rescue a non-related child may be (not necessarily consciously) signaling his superior physical prowess and his willingness to help others.

A costly signaling communication system is important because individuals vary in their possession of desirable qualities (McNamara, Barta, Frohmage, & Houston, 2008), and many desirable qualities are unobservable (Gintis, Smith, & Bowles, 2001). Moreover, one's qualities can affect one's willingness, ability, and availability to provide others with social benefits (Barclay, 2013; Noë & Hammerstein, 1994, 1995). Costly signals provide evidence of underlying characteristics that could inform fitness-enhancing decisions about who to interact with as a mate, ally, or competitor (McNamara et al., 2008).

A key question, and heavily debated issue, of costly signaling theory is what specifically keeps signals honest. In other words, what ensures the association between signal and quality, such that this communication system is not destabilized by cheaters (i.e., signaling dishonestly about underlying qualities; e.g., Getty, 1998, 2006; Higham, 2013; Hurd, 1995; Számadó, 1999, 2011)? Two theoretical possibilities have been offered. Originally, signals were thought to "handicap" the signaler by being extremely costly to perform, such as peacocks carrying heavy tails (the "handicap principle": Grafen, 1990; Zahavi, 1975, 1990, 1995; Zahavi & Zahavi, 1997). This logic suggests that all signalers incur costs (e.g., anyone with a heavy tail incurs a weight cost), but those who truly possess high enough quality ("honest" signalers) pay a lower marginal cost for that signal (e.g., can more easily carry a tail's weight), such that they can afford to send a stronger signal (e.g., a heavier tail) (Grafen, 1990). Recent developments in the theory, however, have shown that the honesty and reliability of signals can be maintained even if no one pays a cost for honestly signaling their quality, as long as there are potential costs for dishonest signaling (i.e., advertising a higher quality level than one actually possesses) (Getty, 1998, 2006; Számadó, 1999, 2011). For example, an individual who falsely presents oneself as having high status would be challenged by more formidable opponents than he could defend against, and it is this "punishment" that prevents individuals from claiming higher status than they actually possess (Tibbetts & Izzo, 2010).

Regardless of whether signaling systems are kept honest and reliable by costs or by potential costs (see Számadó, 2011 for a review), the fundamental logic of costly signaling theory is that producing a given signal has more net fitness benefits for honest signalers than dishonest signalers. Specifically, high quality individuals would incur fewer costs than lower quality individuals to produce a given signal. Or, framed in terms of benefits, producing a given signal allows high quality individuals to reap greater benefits than lower quality individuals.

When signals are honestly linked to the actor's quality, information sharing is mutually beneficial (e.g., Gintis et al., 2001; Zahavi & Zahavi, 1997). Signalers are able to use costly signals to honestly convey their underlying desirable traits to responders. Responders pay attention to these signals to assess the signaler's difficult-to-observe qualities, and then use such information to make fitness-enhancing decisions about who to interact with as potential cooperative partners,

mates, or competitors (McNamara et al., 2008). This shifts the responder's behavior in a way that benefits the signaler, such as being chosen as a partner or avoided as a competitor. Therefore, in turn, signalers and responders gain from being on opposite, but complementary, ends of the signal.

To apply the logic of this theory to heroism, some heroes are essentially costly signalers—high quality individuals who incur fewer costs (or reap greater gains) for advertising desirable traits to observers by providing higher-than-expected benefits to others. Other people pay attention to heroic acts because they gain useful information about the hero's qualities. But, if heroes are costly signalers, what exactly are they advertising? What desirable traits do heroes possess? And is the advertising of some traits deemed more heroic than others? The upcoming sections will attempt to address these questions.

Signaling Hard-to-Fake Traits

Individuals can advertise various traits through costly help. In this section, we will discuss the most prominently advertised traits: Physical abilities, resources, and intelligence. Each of these traits is difficult-to-fake, ensuring that only those who honestly possess them could profitably incur potential costs to produce a signal to others.

Signaling Physical Abilities

In various hunter–gatherer societies, males hunt meat. Although several types of prey may be targeted, males consistently hunt big game (e.g., Hawkes, 1991, 1993; Hawkes & Bliege Bird, 2002; Smith & Bliege Bird, 2000; Wiessner, 2002). Targeting one's foraging efforts towards large game is puzzling because acquiring such prey is dangerous and time-consuming, and success is often unpredictable. Furthermore, big game hunting creates a surplus of meat, which is frequently distributed publicly, rather than monopolized by the hunter. It seems males can better nourish their immediate kin through less risky forms of hunting (e.g., small animals) and gathering (e.g., plant matter) (Hawkes, 1991, 1993; Hawkes & Bliege Bird, 2002).

So why do males hunt big game? Many have argued that hunting big game and sharing the meat publicly serves as a costly signal (e.g., Hawkes, 1991, 1993; Hawkes & Bliege Bird, 2002; Smith & Bliege Bird, 2000; Wiessner, 2002). A successful big game hunter needs skill, strength, and agility. And showing off such traits to others has great benefits for both signalers and observers. Several studies have shown that successful big game hunters enjoy social, political, and reproductive benefits, and that observers who respond to signals benefit as well (reviewed in Hawkes & Bliege Bird, 2002).

Meriam turtle hunters of the Torres Strait, in Australia, benefit from gaining a reputation as a successful big game hunter. Hunting turtles is costly, risky, and potentially dangerous. Hunters not only absorb the monetary costs to fuel boats (approximately 60 Australian dollars for each hunt), but also risk their safety by diving into ocean waters to wrestle and capture 200-pound turtles. Despite all the costs to acquire turtle meat, hunters regularly share and gift the meat to community members, without receiving formal repayment. These successful hunters, however, do not go unnoticed. Instead, they gain hero-like status in the eyes of their community, and such elevated status has perks. Hunters have higher reproductive success than similarly aged non-hunters. Specifically, compared to non-hunters, turtle hunters mate with higher quality females, have more offspring, and gain sexual access to females at a younger age (Smith, Bliege Bird, & Bird, 2003). Hunters are not the only ones that benefit from signaling: Responding to the hunters' signals and interacting with such hunters is also advantageous. Female partners of hunters have also been shown to have higher cumulative reproductive success than other females, suggesting that the costly signals allowed them to accurately assess mate quality.

The Meriam are not the only foragers to place their successful big game hunters on heroic pedestals. Like the natives of the Torres Strait, the Ache big game hunters of Paraguay gain reproductive and social benefits from their risky foraging strategies. Good Ache hunters have more extra-marital affairs and illegitimate children, and have their children more likely to survive, than do worse hunters (Hill & Kaplan, 1988). This general pattern holds true for hunters in other parts of the world, such as the Tanzanian Hadza and !Kung bushmen of the Kalahari desert (reviewed in Hawkes & Bliege Bird, 2002). Older Hadza men who are more successful at hunting have younger wives than other age-matched males (reviewed in Hawkes & Bliege Bird, 2002). And compared to non-hunters, Hadza hunters gain access to younger and more hard-working females, traits that are used as a criterion for a high quality female mate (Hawkes, O'Connell, & Blurton Jones, 2001). Similarly, good !Kung hunters have higher fertility and more surviving offspring than poor hunters (Wiessner, 2002).

The field research on big game hunters in traditional societies appear to be in line with the logic of costly signaling, and these hunters fit our definition of heroism. Why? Because each of them go beyond their expected level of delivered benefits by not just providing a surplus of meat that feed kin and non-kin, but also by engaging in risky and dangerous foraging strategies to do so. So, their acts fit the bill of heroism in two crucial ways. First, their foraging is risky, posing a potential threat to their safety—this can impose large costs. And second, they are also generous, enabling others to gain from their actions.

Big game hunting is not the only way males can show off their physical abilities and be deemed heroes. Males can engage in various other forms of risk-taking, which serve as equally good signals of superior health, vigor, strength, and skill. And these behaviors gain them substantial social status and reproductive benefits. Kelly and Dunbar (2001), for example, showed that men who were brave (i.e., took risks) were more attractive as short-term and long-term romantic partners than men who did not do so, especially when the bravery benefited others (heroism) and was voluntary rather than part of someone's job. Adding to this literature, Farthing (2005) specified that heroic risky behaviors were more valued than other risky behaviors. Farthing distinguished between four types of risk-taking: (a) Risks that pose a threat to one's physical safety and benefit another (e.g., rescuing a person from a burning building; saving a drowning child in a raging river), (b) acts that involve a physical risk but no benefit to others (e.g., risky sports), (c) risky alcohol or drug use, and (d) financial risks. Not unexpectedly, only certain forms of risk-taking were deemed valuable in a mate and ally. In particular, results illustrated that females were most attracted to males who engaged in acts that were physically risky and benefited others. If the benefits to others were removed from the equation, however, the pattern evidently reversed. Specifically, females preferred males who *avoided* physical-only, drug, and financial risk. Thus, it appears that females prefer helpful men, but have a higher preference for men who show heroic helpfulness (i.e., acts that involve physical risks and benefit others). Men, in turn, are aware of this and are more likely to display courage, strength, and bravery through helpful acts when primed with mating motives (Griskevicius et al., 2007).

In sum, engaging in potentially physically risky behavior that benefits others, whether in the form of big game hunting or rescuing a person from a burning building, signals valuable information to others about the actor's quality. When this information is highly beneficial and valuable to observers, all parties to the signaling equation receive gains. Actors use their superior quality to share greater-than-expected benefits with others, leading them to receive reproductive benefits and other perks of elevated status by being deemed heroes. And, observers can increase their reproductive success by associating with these heroes.

One factor that has been prominent in this section is the notion that heroism is defined by *physically* risky behaviors that benefit another individual or others. This definition is consistent with the popular conception of superheroes, such as Superman and Batman, who put themselves in *physical* harm's way to help others. And, as mentioned earlier, the Carnegie Medal is awarded

to those who incur *physical* costs to save others. But, does one necessarily need to have advanced *physical* abilities, health, strength, and/or skill to be heroic? Isn't the person who donates millions of dollars to help find the cure for sleeping sickness as much of hero as an individual who carries the parasite-ridden child to the hospital to receive medical attention? Isn't the individual who diffuses a bomb to save the lives of many equally as heroic as the person who uses his body to shield others from the explosion? We would argue yes. We define a hero as someone who goes *above and beyond the expected levels of delivered benefits*, regardless of whether these benefits were delivered through one's superior physical abilities, excessive wealth, or intelligence. The next two sections discuss the notion of heroism as costly signals of wealth and intelligence.

Signaling Resources

Philanthropists can achieve great fame. John Rockefeller, for example, contributed over $500 million of his wealth to humanitarian causes such as The Rockefeller Foundation, which seeks to promote the well-being of humanity throughout the world by advancing more inclusive economies (New York Times, 1937). Bill Gates is renowned for sizeable donations to several causes, including his $50 million contribution to Save the Children, a global campaign dedicated to saving the lives of newborns, and the billions of dollars that founded the Bill and Melinda Gates Foundation (Diamond, 2015). Mark Zuckerberg, the founder of Facebook, is also known for his generosity, and has contributed $100 million dollars to Newark, the New Jersey Public School System (Inside Philanthropy, 2015). All three of these philanthropists provided above expected levels of help to millions around the world through their extravagant financial contributions. And providing such supererogatory help can give such philanthropists hero-like status (e.g., Lane, 2013; Lewis, 2015; Snyder, 2011).

By taking a financial risk or giving away a portion of their wealth, philanthropists are not just benefitting many individuals; they are also sending a (not necessarily conscious) costly signal to observers about their access to resources. The whole world knows that John Rockefeller, Bill Gates, and Mark Zuckerberg are incredibly rich. We know this to be true because the reputational benefits accrued from donating millions of dollars would not be worth the crippling financial effects on their lifestyle if they did not truly possess such wealth. That is, there is a better benefit-to-cost ratio for honest signalers, compared to dishonest signalers, for signaling at a given level (e.g., donating $100 million dollars to charity). And, thus, only those who honestly possess such wealth are willing and able to accept financial costs or risks to deliver greater-than-expected benefits to others.

You might be wondering if such million dollar donations are truly considered generous given the wealth of these philanthropists. After all, how generous is a million dollar donation when one is worth several billions? To answer this question, we must remember that generosity is a relative, as opposed to absolute, concept (Barclay, 2013). Accordingly, whether one's actions will be deemed generous is not just dependent on one's level of helping, but also on the level of helping exhibited by others. Take for example, a population whereby everyone gives x units to charity per month. Because donating x units is the norm, doing so would not make one appear generous in this population, even though donating to charity may be a generous act in absolute terms. Donating $x + 1$ units, however, allows one to be viewed generous because this show's one's ability and willingness to go beyond the norm of giving to charity. Conversely, donating $x - 1$ units may make one appear selfish. Using similar logic, philanthropists' donations may be a small portion of their wealth, but in comparison to other rich individuals who rarely donate their wealth to the less fortunate, such millionaire donors are very generous. Furthermore, regardless of whether such donors are seen as "generous," they are certainly seen as "wealthy" (for the former, see further below).

Generous displays that signal access to resources are also common in traditional cultures and

societies. The Kwakiutl of Vancouver Island, for example, host extravagant ceremonies called "potlatches" whereby chiefs of tribes use conspicuous generosity to compete with each other for status and prestige. To maintain or elevate their status, chiefs must give away costly resources, such as food, canoes, and blankets to other tribes (Goldman, 1937; Piddocke, 1965). These potlatches are extremely costly and appear to serve as a reliable and honest signal of a chief's access to resources (Goldman, 1937; Piddocke, 1965).

Similarly, several New Guinean tribes, such as the Metlpa, Enga, and Gawil, engage in pig exchange ceremonies known as "mokas" (Brown, 1978). During mokas, pigs are exchanged among tribes to signal wealth and resources, and maintain status. Pigs are the main means of exchange because they are difficult to rear, time-consuming, and costly. Many pigs die before reaching adulthood, and fattened pigs, which are highly valued at mokas, require tribes to have a surplus of food to feed and sustain the weight of these large animals. Thus, much like potlatches, mokas are a costly signal of a tribe's wealth.

Signaling Intelligence

If you ask individuals "who is your hero," some of the answers will be of people with great physical ability or wealth. But many answers will be of people who have contributed greatly to our artistic or intellectual culture, such as musicians, artists, scientists, and inventors. This is because heroism need not involve the delivery of benefits through superior physical ability or wealth. Instead, one could confer above expected levels of benefits by using one's intelligence. Alexander Graham Bell, for example, might not have physically risked his life to help others the way the Meriam turtle hunters do, but he revolutionized the lives of millions across the world with the invention of the telephone. Likewise, Charles Babbage, a British engineer, changed the world and the way people live when he developed the first computer. Bell and Babbage may not be considered heroes in the conventional sense, but these two men have incurred costs and risks to deliver greater-than-expected benefits to others. And given the benefits they have conferred on others, Bell and Babbage could be deemed *intellectual* heroes—people who have used their *intelligence* to confer above expected levels of benefits to others.

Although little empirical work has explored the notion of intellectual heroism, research to date has revealed some related findings. Theoretical work has suggested that intelligence is costly and difficult-to-fake, suggesting that it may be a valuable trait to signal to others. The idea here is that the human brain—and the phenomena it produces—is like a peacock's tail for display to others (Miller, 2000). Brains, much like peacocks' tails, are difficult to build and maintain, and cannot be faked. Developing a large brain is not only time-consuming, it is also energetically expensive and anatomically complex (Dunbar & Shultz, 2007). Because of the high costs associated with building and maintaining brain tissue, some researchers have argued that intelligence may be a reliable indicator of genetic quality and may have been a target of sexual selection (e.g., Furlow, Armijo-Prewitt, Gangestad, & Thornhill, 1997; Haselton & Miller, 2006; Luxen & Buunk, 2006; Miller, 2000).

Displays of intelligence could also be useful for indicating that one has the capability to confer benefits on others (Barclay, 2013, 2016). In fact, studies show that intelligence and competence (e.g., Anderson & Kilduff, 2009; Driskell, Olmstead, & Salas, 1993), as well as generosity and commitment (e.g., Hardy & Van Vugt, 2006; Willer, 2009), consistently predict elevated status, in terms of ability to sway and determine the direction of group decisions (for a review, see Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013). Furthermore, intelligent people may be valued as social partners because others will have the opportunity to learn useful skills simply by observing them (Henrich & Gil-White, 2001) or because they can use their intelligence to access resources.

Thus, while scientists sitting comfortably in research labs might not fit most heroic prototypes, such individuals can be consistent with our definition of heroism in two fundamental ways. First,

these individuals use their intellect to deliver greater-than-expected benefits to others through their inventions. These inventions can, and have, changed the lives of many in revolutionary ways. Second, such intellectual heroism can be risky. Of course, intellects are not necessarily risking their lives like conventional heroes. But, scientists are risking their time on potentially fruitless inventions that may never succeed, let alone amount to anything useful. So, the risk of science is that one's time is wasted on experimenting with non-useful inventions instead of bringing in a steady income that could better allow financially stability and increase reproductive success.

Signaling a Willingness to Help

Two of the most important things to know about others are the likelihood that they will help you and the likelihood that they will harm you (Barclay, 2016). If someone is known for helping others in your in-group, then there is an increased likelihood that they will help you. Thus, large displays of heroism can function to (unconsciously) signal a hero's cooperative intent, such that audiences are more cooperative and more trusting with the hero. This benefits the hero, creating a selection pressure for mechanisms that cause extreme helping.

What maintains the honesty of such signals of cooperative intent? Long-term interactions are crucial, because people who are cheated will generally cease cooperating with the cheater. The benefits of "suckering" someone are thus short-term benefits. A costly public cooperative gesture would not be worth it for anyone who intended to cheat someone at the first opportunity: the cost of the public help would outweigh the short-term benefits of "suckering" someone (André, 2010; Barclay, 2016; Bolle 2001; Ohtsubo & Watanabe, 2009; Smith & Bliege Bird, 2005). Conversely, such cooperative displays would be worth it for someone with genuine cooperative intent, because the long-term benefits of mutual cooperation can outweigh the cost of the public help. This form of signaling remains honest even if everyone pays the same fitness cost for helping, because the honest signalers receive larger long-term benefits than the dishonest signalers. In the past, this type of signaling was used to explain more "mundane" types of helping that everyone could do equally well, like volunteering one's time (Barclay, 2013; Barclay & Reeve, 2012), but could in principle apply to more "extravagant help" including heroism.

Do people treat helpful behavior as a signal of cooperative intent? According to multiple studies, it pays to be nice (e.g., Barclay, 2004, 2006; Clark, 2002; Milinski, Semmann, & Krambeck, 2002). Specifically, behaving generously can serve as a signal of one's cooperative intent, i.e., the degree to which one is likely and willing to cooperate with, instead of exploit, another individual. And, showcasing one's cooperative intent appears to benefit signalers by giving them access to social partners and opportunities. For instance, those who behave generously are deemed to be of high status and perceived as highly trustworthy (Barclay, 2004; Hardy & Van Vugt, 2006; Price, 2003; Van Vugt & Hardy, 2010; Willer, 2009). Furthermore, those who contribute more than their fair share towards a common good are generally preferred as interaction partners (Barclay & Willer, 2007; Sylwester & Roberts, 2010), leaders (Milinski et al., 2002), and long-term romantic partners (Barclay, 2010). As a result, engaging in various acts of generosity also increases the status and reputation of the signaler (reviewed by Kafashan, Sparks, Griskevicius, & Barclay, 2014).

Using Generosity to Compete

One way that almost anyone can increase their value as a cooperative partner or mate is to be generous. Behaving generously increases one's desirability as a partner because it displays one's enhanced ability and willingness to offer and/or share benefits within a partnership (Barclay, 2013; Noë & Hammerstein, 1994, 1995). This fact incentivizes individuals (not necessarily

consciously) to act *more* generously than others in their social environment. By being more generous than others, individuals can signal *greater* qualities to potential partners, allowing them to out-compete others to access to the most beneficial partnerships (Barclay, 2013, 2016; Noë & Hammerstein, 1994, 1995; Roberts, 1998). This notion of escalating one's generosity to be *more* generous than those around you is known as competitive altruism or competitive helping (Barclay, 2004, 2011; Barclay & Willer, 2007; Roberts, 1998; Van Vugt, Roberts, & Hardy, 2007).

Findings from many lab studies support the signaling logic of competitive altruism. For example, people give more to their partners in economic games when such contributions are public instead of private (e.g., Hardy & Van Vugt, 2006; Milinski et al., 2002), and, most importantly, if public contributions are coupled with the opportunity for partner choice, then people escalate their contributions even further (e.g., Barclay, 2004; Barclay & Willer, 2007; Sylwester & Roberts, 2010). This suggests that people are actively competing with others for interaction partners by being more generous (see also Raihani & Smith, 2015). Additional studies have shown that being more generous than others allows one to gain a reputation for trustworthiness and high status (Barclay, 2004; Hardy & Van Vugt, 2006; Price, 2003; Van Vugt & Hardy, 2010; Willer, 2009).

Researchers have applied the logic of competitive altruism to understanding extravagant forms of helping (e.g., Barclay, 2010; Van Vugt et al., 2007), suggesting that heroism is one way to compete for status, which in turn enables one access to social benefits. And, heroes may be more inclined to such competitive altruism than the average individual because they pay a lower marginal cost to provide greater-than-expected benefits to others. Of course, individuals do not need to be conscious of the link between competitive altruism and fitness to engage in such prosocial behaviors.

Non-Adaptive Explanations of Heroism

So far we have discussed adaptive explanations for heroism, by showing that the benefits of extravagant helping can outweigh the costs for actors involved. Of course, there are many non-adaptive instances of generosity. That is, people sometimes help others in situations where the benefits of being helpful do not outweigh the costs, and such heroic behavior does not increase the inclusive fitness of the generous individual. Contrary to popular misconceptions, evolutionary theory does not predict helpful behavior will only be used adaptively. For any given decision making process, errors and mistakes are inevitable (Johnson et al., 2013). Evolved mechanisms do not perform perfectly all the time. There are instances where mechanisms break down, leading to unintended consequences for one's behavior. Although a thorough review of non-adaptive explanations of generosity is beyond the scope of this chapter (instead, see Barclay & Van Vugt, 2015), it is worth briefly mentioning three non-adaptive explanations to add to our discussion of evolutionary perspectives on heroism.

Mistakes

Our decision-making mechanisms have evolved to be *adaptive on average*. That is, on average, over time and across situations, adaptive mechanisms will yield more benefits than costs, increasing the inclusive fitness of the actor. However, *mistakes* are inevitable (Johnson et al., 2013). Because mechanisms are only adaptive on average, there might be certain situations or circumstances where one does not receive benefits from helping. As examples, one may help an individual who does not reciprocate, or one may perform help in private when reputational benefits are not possible.

Mistakes resulting in extreme forms of helping are also possible. Although many may receive fitness benefits for their heroic deeds, some heroes, unfortunately, pay the ultimate price. That is,

heroes occasionally lose their lives by attempting to rescue non-relatives from danger. In such situations, the costs may far exceed the benefits of extreme helping, such that the heroic act does not increase the inclusive fitness of the individual.[2]

If there are such high potential costs associated with heroism, what sort of decision making process might lead one to be a hero? Recent research reveals that heroic action may, in fact, be a result of mistakes in a given decision making process. Specifically, Rand and Epstein (2014) found that recipients of the Carnegie Medal acted heroically without deliberate thought, but instead with extremely quick, intuitive, and automatic processing. Rand and Epstein argue that such findings are consistent with the Social Heuristics Hypothesis (Rand et al., 2014), which suggest that heroes may be wrongfully overgeneralizing the gains from low-stake cooperation (i.e., helping in low-stake situations is a long-term fitness enhancing strategy) to more extreme, dangerous forms of helping (where low-stake cooperative gains do not apply). Thus, under this line of thought, it is possible that heroism is a product of a mistake in a decision making process. But, despite this, some heroes might have been able to reap more gains than costs in performing heroic action. And, as long as such non-adaptive instances of giving are outweighed by adaptive instances (i.e., when help is reciprocated at a time of need, one performs helping that results in reputational benefits, and/or one lives to reap the social benefits of heroism), then prosocial sentiment would still be adaptive and genetic variation associated with such sentiment will increase in frequency over generations (Delton, Krasnow, Cosmides, & Tooby, 2013).

Outliers

Individuals vary in countless ways, from their genetic make-up, to their environment of upbringing, past experiences, and learning ability. For any trait that involves variation, the distribution of that trait resembles a bell curve (Tooby & Cosmides, 1990), especially when multiple genes are involved. Although there may be an optimal level of a trait, random variation inevitably exists. Such variation can be a result of random mutations, recombination of different genes, and selection pressures being imperfect. Most people will exhibit near-optimal levels of the trait (e.g., helping not much more or less than needed to receive benefits to outweigh the costs), while others will be on the tail end of this distribution, either being overly helpful or overly selfish. Thus, if one is extremely generous and performs heroic deeds without gaining the fitness benefits to compensate for the costs of such kindness, one might just be on the tail end of the distribution.

Breakdown of mechanisms

Perturbations or accidents during development can also lead to a *breakdown of mechanisms*. Humans are subject to various pathologies throughout development, and exposure to perturbations, such as pathogens, genetic mutations, or physical trauma, could result in non-adaptive forms of helping. For example, stroke victims sometimes display pathological generosity and become completely selfless, even though doing so harms them and their relationships (Ferreira-Garcia, Fontenelle, Moll, & de Oliveira, 2014). Is it possible that some heroes have experienced some brain damage that causes them to be so selfless? This remains a theoretical possibility.

Why Call Someone a Hero?

So far, we have focused on understanding heroism from the hero's perspective: We've argued that the costs borne by heroes can be compensated by status benefits delivered. But, a thorough investigation of the evolutionary existence of heroism requires examination of the observer or judge—those who call others heroes and bestow status benefits on these heroes. In this section,

we look at the other side of the transaction and examine heroism from the judge's perspective. In other words, we offer tentative answers to the general questions: what is in it for the observer or judge, and why might someone deem another a hero?

One type of explanation for hero judgment is that heroes can serve as role models—imitating them can be a path to success. Seeing Michael Jordan achieve fame and fortune through his basketball heroics (and urged on by the famous Gatorade commercial), many young athletes wanted to "be like Mike." But imitating successful people does not require publicly declaring their heroism; one's choice of role model could be purely private. Most hero judgments, however, are often not private matters—why? In this section we focus on explaining hero judgments that are publicly declared, defended, and acted upon.

Although little empirical work has directly investigated this issue, we use well-defined evolutionary-minded theoretical concepts to speculate about this topic. In doing this, we begin by examining the costs of making heroism judgments, and then move on to consider when benefits might offset these costs.

The Costs of Heroism Judgments

High status allows heroes greater access to social rewards and a greater share of finite resources. So a judgment that someone is a hero is equivalent to a judgment that the heroic person should be granted elevated status and its accompanying rewards—implying that the judge herself should have relatively less status and reduced access to valued resources. Thus, hero judgments can involve suppressing one's own status and thereby future access to resources. Current resources are also on the line. People give gifts to their heroes, spend time honoring them, and argue about who is or isn't heroic, using precious time and social capital. Declaring some people to be heroes (e.g., NSA whistleblower Edward Snowden) could limit your access to certain social opportunities (e.g., jobs with intelligence agencies). These resource costs and forgone opportunities represent some of the meaningful costs of making hero judgments.

Further, people often must incur costs to defend their hero judgments, sometimes leading to costly conflict between those with differing judgments. After MSNBC journalist Chris Hayes expressed discomfort with the widespread practice of automatically calling deceased United States military members heroes, a panel of pundits on *NBC Today* condemned his comments and added that Hayes "looks like a weenie" (Drennan, 2012). Hayes apologized for his comments and kept his job. For disputing the heroic status of his country's military, Australian sports commentator Scott McIntyre was fired by Special Broadcasting Services and harshly criticized by Communications Minister Malcolm Turnbull (Whitbourn, 2015).

Why do people risk their jobs to voice their opinion about who is or isn't a hero? Why will people condemn, insult, or even threaten the livelihood of someone who disagrees with their hero judgments? Incurring costs to confer benefits on someone else is the definition of (costly) cooperative behavior, so our explanations of heroism judgment are specific implementations of a broader explanatory framework for explaining costly cooperation. As such, the theoretical concepts about cooperation on which we base the following discussion are generally well-established (Barclay & Van Vugt, 2015), but our application to the specific topic of heroism is speculative.

Benefits of Heroism Judgments

Just as the costs borne by heroes present an evolutionary puzzle—are there corresponding benefits for heroes?—the costs borne by judgers of heroism demand functional explanation—why incur costs to bestow status upon others? In this section, we discuss the various benefits that can accrue to those who make good heroism judgments (i.e., those who receive a higher benefit-to-cost ratio for their heroic judgments).

Reciprocity Benefits: Heroism Judgments as Prestige-for-Help Transactions

> My hero!
>
> *Damsel in distress to her rescuer*

Heroism judgments can be half of a mutually-beneficial transaction—a hero performs some special deed that directly benefits the judge and receives prestige in return (Chapais, 2015). This could be a one-time transaction, or part of an ongoing series of exchanging help as in an alliance. Endorsing the heroism of someone who helps you personally can thus be a form of reciprocity, perhaps a very efficient form. Rather than help your ally (or rescuer) with a direct transfer of your own resources (especially difficult if a monster has you captive in its lair), you instead will convince others to grant prestige and resources to your ally by proclaiming the ally's heroism. In addition to maintaining the relationship (and/or your reputation, see below) by meeting your reciprocal obligation, your ally is then in a stronger position to provide further benefits to you, and can be more confident that you'll continue returning the favour.

Nepotistic Benefits: Heroism Judgments as Helping

Humans show nepotistic biases in a variety of their cooperative behaviors (e.g., Stewart-Williams, 2007, 2008), suggesting that people might bias their heroism judgment in favor of kin. A recent Harris poll seems supportive (Pollack, 2014). Over two thousand and five hundred American adults spontaneously named three heroes; more people named at least one family member (32%) than any other category, including military (21%), religious figures (19%), medical and emergency services personnel (18%), US presidents (17%), activists and humanitarians (12%), and celebrities (11%).

The costs invested in promoting the heroism of family members can be repaid in inclusive fitness benefits if the heroic kin convert their status gains into reproductive success (Hamilton, 1964). Furthermore, our kin are the people most likely to provide help to us when we need it, so enhancing their status and resource access may indirectly create future benefits for us. Additionally or alternatively, having heroic kin or allies might elevate our own status. For example, we might gain resources and opportunities from people seeking the favor of our heroic sibling.

Reputational Benefits: Heroism Judgment as Costly Signaling

Costly signals honestly advertise the ability and willingness of the signaler to provide benefits to partners, and the potential costs of such advertising can be compensated by the benefits associated with increased access to quality partners. We have argued that acts of heroism can function as costly signals; here we argue that judgments about heroism can function similarly. It is probably quite clear why heroes make desirable partners: who *wouldn't* want a friend with exceptional ability and/or willingness to deliver benefits? Alas, most of us are unexceptional (by definition) and will therefore be unlikely to attract exceptional partners—but we still want the best available partners from our pool of non-exceptional folks (Barclay, 2013, 2016). Heroism judgments can facilitate partnerships by revealing honest information about the partner quality of the judge.

What desirable abilities underlie heroism judgments? Naming a hero requires understanding and applying the concept of heroism. Someone who earnestly asserts that a puddle or a rock is heroic has demonstrated a basic misunderstanding and is therefore probably not a desirable partner. Good hero judgments that actually contribute to the status of heroes require more than the simple ability to distinguish humans from non-living entities. Recognizing who are

exceptional deliverers of benefits requires the ability to understand and track complex social behaviors and relationships, such as who did what to whom, how these behaviors affected everyone involved, how this history will be perceived by others, etc. Convincing others to recognize the status of heroes, or at least respect our judgment, requires abilities of persuasion and influence. For example, to successfully argue that Charles Darwin was a hero might require special abilities like general knowledge about science and history, expertise in evolutionary biology and its influence on other fields, and the verbal and reasoning skills to make a compelling case.

In addition to demonstrating these types of abilities that make us potentially valuable to our partners, heroism judgments can also signal willingness to help our partners. We can adhere to partners' expectations about what is fair, good, and reasonable by not exhibiting unjustifiable selfish biases (DeScioli et al., 2014). Relentless advocacy of the heroism of in-group members could demonstrate loyalty to the group, which may enhance the advocate's access to group benefits.

Political Benefits: Heroism Judgments as Social Niche Construction

Niche construction (Laland, Odling-Smee & Feldman, 2000) is a process whereby an organism modifies its immediate environment—its niche. Widespread recognition of a hero sets a precedent, incentivizing certain kinds of behaviors by implying they can be rewarded with prestige. To the extent such precedents are widely known, heroism judgments have social/political consequences that can shape our environments and can be regarded as a form of social niche construction. Changes to a feature of a social/political environment will have different effects on different people within that environment, depending on their own personal ability to exploit the change for their own benefit (DeScioli et al., 2014; Weeden & Kurzban, 2014). People's attitudes towards these influential features of the social environment, features such as what kinds of behaviors are rewarded with prestige, can be expected to reflect their varying interests and abilities relevant to those behaviors.

This type of social niche construction perspective on the function of social judgments has received support in recent studies showing that moral condemnation judgments reflect the interests of the judge. For example, those more vulnerable to pathogens and exploitation more intensely condemn disease-spreading behaviors (van Leeuwen et al., 2012) and exploitative acts (Petersen, 2013; Sparks & Barclay, 2015), respectively. The connection between a judgment and the judge's interest can be more subtle. For example, dedicated monogamists tend to condemn recreational drug use (Kurzban, Dukes, & Weeden, 2010). Drug use doesn't directly harm the monogamists, but drug users also tend to be promiscuous. Promiscuous people do threaten the interests of monogamists—their sexual availability may tempt the partners of monogamists into infidelities. Monogamous people's condemnation of drug users thus functions as moral pretense for imposing costs upon reproductive rivals (Kurzban et al., 2010).

Heroic praise (e.g., moralization of political heroes like Gandhi and Martin Luther King, Jr.) is roughly the opposite of moral condemnation (e.g., disapproval of political villains like Hitler and Pol Pot). And thus, these two forms of judgment can be expected to follow roughly similar functional logic. Heroism judgments can benefit the judge if the judgments lead to changes in the judge's social environment that the judge is well-positioned to exploit. For example, the authors of this chapter might endorse the Nobel Prize candidacy of an evolutionary biologist, not because we work with her or have been directly helped by her work, but because her academic heroism might cause Universities to become more interested in hiring and supporting other academics who study evolution … like us!

Context-Specificity of Hero Judgments

Heroism judgments can be made in a wide variety of different contexts: telling children a story, applauding at a ceremony, making a charitable donation, debating sports over beers in a pub, considering a job offer from a prestigious employer, deciding whether to support a revolutionary leader against an oppressive regime. The magnitude(s) and source(s) of costs and benefits can vary widely among these circumstances, so we expect judgment to be based on some kind of integration of context-specific estimates of the various payoffs. For example, people tend to care about the intentions of others, preferring to partner with those who cooperate without the appearance of self-interested calculation (Hoffman, Yoeli & Nowak, 2015). This suggests that heroism judgments of those who expect to benefit from future reciprocity with the hero will be influenced by what the judge believes to be the hero's intentions. In contrast, for judgments that capture political benefits, the hero's intentions are only relevant insofar as they influence the judge's ability to change the social environment.

Thus, an evolutionary scientist may claim Darwin as her hero if she's asked while interviewing for an academic job. But, the same scientist might proclaim Miles Davis as her hero if she is trying to join a band. Hero judgments may be different when writing a eulogy than when chatting on a first date. The judgments may be different depending on who is in the casket and the audience for the eulogy, and whether the date is with a solider or a peace activist.

Real-World Applications

We have now reviewed various evolutionary concepts related to heroism, and addressed the evolutionary function of performing heroic acts (actor's perspective) and calling someone a hero (judge's perspective). All of this information is well and good, but knowledge is only useful if it can be applied to effect change. So, how can we apply these ideas about heroism to promote heroic behavior?

We have argued that heroism may function to signal desirable qualities to observers of the heroic acts; now we cautiously recommend harnessing these forces of reputation to encourage more societal cooperation (see also Barclay, 2012). Field experiments show that reputation can help solve many real-world problems where cooperation otherwise breaks down, including littering, energy overuse, and underfunded charities (reviewed by Kraft-Todd et al., 2015). The same thing can happen with many other types of heroism we have discussed. When heroism is better publicized, it enhances the reputational incentives necessary for heroism to spread. This is more than people blindly imitating what others do: audiences will also see the recognition that heroes receive, which gives them good reason to preferentially imitate heroes. Important note: we are not suggesting explicitly providing rewards to heroes—instead we are suggesting providing opportunities for heroes to gain recognition for their actions, and audience's natural responses will naturally provide those rewards.

Slate.com used to publish the *Slate 60*, a list of the 60 biggest personal charitable contributions in each year—these are all multi-million dollar donations that truly deserve to be called heroic. Although slate.com apparently no longer publishes this list, other news agencies now do so. Such lists not only encourage hero-sized donations, but also create competition among philanthropists to be a *bigger* hero than others. People like to compete with each other, so why not harness that urge for good by inciting competitive helping (Barclay, 2004, 2013; Barclay & Willer, 2007; Roberts, 1998)? Such lists of "biggest heroes" could apply to any domain where we need people to lead the way, whether it is personal philanthropy, corporate philanthropy, environmental sustainability, pollution control, or social, ethical, and moral responsibility. Many magazines publish lists of companies that do the most for their employees or to protect the environment; we can imagine similar lists in these other domains as well. It is better to have people compete

in these domains than in less beneficial ways such as overconsumption. And why must people always compete nationally to be the biggest heroes? Local lists in local publications may be most effective at promoting "everyday heroism," given that people compare themselves most with the people they interact with the most. The positive effects of countless "everyday heroes" might well outweigh the effects of focusing on a select few "uber-heroes."

When publicizing heroism in any domain, we would encourage larger lists like Slate's 60 biggest donations, rather than smaller lists like the 10 biggest donations. Large lists encourage competitive philanthropy among givers who would not make the top 10 but could still gain wide recognition for being, say, the 48th biggest donor (who gave over $20 million in 2010). Much heroism would go unrecognized if we only ever know the single biggest donors, and signaling theory predicts that those who cannot win a competition (e.g., be the biggest hero) may stop trying (e.g., Barclay, 2016; Dessalles, 2014). Larger lists could still focus more on the biggest donors in order to encourage ultra-philanthropy among the uber-rich, while giving some recognition to others whose philanthropy is only slightly less heroic.

While we recommend harnessing the power of reputation to promote heroism, it would be irresponsible of anyone to make recommendations without providing appropriate cautions and limitations. The science of reputation is still relatively new, so there are still several unknowns, as well as some known limitations (Barclay, 2012).

The biggest risk of promoting heroism with reputational incentives is that such attempts will accidentally undermine prosocial goals (Barclay, 2012). It is hard to decipher someone's motives if they have extrinsic incentives for their behavior. Who would you trust more: someone who jumped into a dangerous river to save a baby even though no one was looking, or someone who did so in front of a live television audience? We suspect the former. While both baby-savers may have equally heroic character, it is hard to know whether the second one risked his life because he genuinely wanted to help or because he knew the cameras were rolling. Research shows that people who help others are viewed as less charitable if the helper receives direct benefits for her actions or if the recipient was a close friend of the helper (Lin-Healy & Small, 2012, 2013). A similar effect could occur with reputational benefits: audiences might attribute less charitable motives to heroes if it is common knowledge that heroes will be publicly rewarded. People might then be less heroic if they anticipate public questioning of their motives (Barclay, 2012; Bénabou & Tirole, 2006).

This may be an example of how extrinsic incentives can undermine intrinsic incentives for action (Deci, Koestner, & Ryan, 1999). One famous example is when daycares introduced small fines for parents who picked up their children late, and parents' lateness got *worse* (Gneezy & Rustichini, 2000a; see also Kraft-Todd et al., 2015). The fines made it unclear whether parents arrived on time to be nice to the daycare workers or simply to avoid the fines—the extrinsic incentives undermined the signaling value of arriving on time, thereby undermining the social incentives to arrive on time (Bénabou & Tirole, 2006). In a similar vein, explicit intrinsic incentives for heroism may undermine its value for signaling the hero's good character, and thus inadvertently undermine heroism (Barclay, 2012).

Barclay (2012) suggests some ways to prevent this undermining. For example, rather than explicitly rewarding heroes, would-be social engineers could simply create opportunities for heroes to acquire a good reputation from others. They need not mention any benefits when doing so, and indeed should *not* mention such benefits! Furthermore, they could compare heroes with people who incur similar costs for less noble causes (e.g., starting charities versus buying bigger houses). If explicit top-down incentives are ever used, they need to be big enough to fully repay the cost of heroism or else they will be counter-productive—as the title of Gneezy and Rustichini's classic paper (2000b) says, "Pay enough or don't pay at all." A mixed design that involves both explicit material rewards and reputational rewards may have the beneficial effects of neither.

★ ★ ★

We began this chapter by first defining heroism as an extreme form of prosociality, whereby heroes deliver greater-than-expected benefits for a given cost. We then examined how and why evolutionary theory sets expected levels of benefits for cooperation by reviewing models of kin selection, reciprocity, vested interest, and punishment. Establishing expected levels of benefits then enabled us to explore evolutionary reasons for why heroes go above expectations and why observers bestow status on these individuals. Under a costly signaling interpretation, heroes are viewed as high quality individuals that pay lower potential costs (or reap greater benefits) for delivering supererogatory benefits to others. Field and lab evidence supports this logic. We extended this logic beyond the displays of physical ability exhibited by archetypal heroes, to the displays of resources and intelligence of philanthropic and intellectual heroes. The judge's side is equally relevant in the discussion of heroism, as observers willingly bestow great status on heroes, allowing heroes access to precious finite resources. Although judges may incur costs by deeming someone a hero (e.g., suppressing one's own status and access to future resources; limiting opportunities), there could be potential benefits that surpass such costs. We speculate that these benefits could increase one's fitness via reciprocity, nepotism, reputation, and social niche construction.

To conclude this chapter, we cautiously offered examples of how to apply evolutionary perspectives on extreme helping to encourage more heroic behavior. It may be particularly important to create opportunities for people to observe and acknowledge heroism: such opportunities enable observers to bestow status on heroes, further incentivizing and reinforcing heroism. Publicizing and making lists larger could also ensure that no hero goes unnoticed, again creating motivation to be a hero. As mentioned, there are potential risks of harnessing the power of reputation to promote heroism (e.g., Barclay, 2012). But, with careful implementation and further investigation, these risks may be well worth the gains.

Notes

1 In this chapter, several terms, such as generosity, kindness, cooperation, altruism, and helpful acts, will be used interchangeably to refer to the above definition.

2 Losing one's life may not be a "mistake" in that the act could still increase the inclusive fitness of the hero if the rescued individual is a close relative (i.e., kin selection: Hamilton, 1964) or if kin receive benefits from others because of the hero's dying act, e.g., increased status or money to relatives (Blackwell, 2006; CBSNews.com, 2002).

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