

Review

A Dual Model of Leadership and Hierarchy:
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From the popularity of authoritarian political leaders to the under-representation of women in boardrooms, leadership is an important theme in current human social affairs. Leadership is also a prominent research topic in the biological, social, and cognitive sciences. However, these active literatures have evolved somewhat independently and there is a need for synthesis. A comparative-evolutionary approach can integrate seemingly divergent perspectives by making a distinction between two leadership styles, prestige and dominance, that have contrasting expressions, functions, histories, and neural and developmental pathways. The distinction may help to resolve various scientific puzzles, such as: (i) opposing views on the different functions and expressions of leadership; (ii) the appeal of dominance-style leaders; and (iii) sex biases in leadership emergence in modern society.

The Nature of Leadership

Leadership (see [Glossary](#)) is a relevant topic in current social affairs, from the recent popularity of authoritarian political leaders to the under-representation of women in corporate boardrooms. Leadership, which we define in terms of having a disproportionate influence on collective actions and group decisions, has been widely studied in the social and biological sciences, generating proximate and ultimate explanations for its emergence [1,2] ([Box 1](#)). Recently, cognitive scientists have also shown an interest in the neural mechanisms by which particular leaders attract and exercise influence on **followership** [3]. However, many questions remain regarding the evolution of human leadership, the most important being whether leadership is a single behavioral category or whether there are different kinds (styles) of leadership each with their own behavioral signature, adaptive function, phylogenetic history, and neural and developmental pathways.

Here we argue that there are two leadership styles: prestige style and dominance style. The first type of leader exercises influence by conferring (or promising to confer) benefits on followers and the second by inflicting (or threatening to inflict) costs on nonfollowers. The prestige–dominance model has been influential in the evolutionary behavioral sciences, mainly in distinguishing the ways in which people accumulate **status** in groups [4,5]. One manifestation of status is the relative influence of different individuals on group decisions – thus, leadership. However, not all leaders are necessarily high-ranking individuals, such that leadership and status are not identical ([Box 2](#)). Nevertheless, the prestige–dominance theory can be usefully extended to understand the different functions and expressions of leadership across taxa, thus contributing to evolutionary theories of **social hierarchies**. Based on accumulating evidence from diverse fields, we assert that a combination of factors, including evolutionary history, developmental experience, and hormonal/physiological and psychological mechanisms as well as contextual factors interact with individual traits of leaders (e.g., age, sex, physique, personality, social status, competence) and follower preferences to favor the emergence of two leadership styles: prestige and dominance.

This dual model contributes to evolutionary theory because it raises the possibility that natural (and sexual) selection has shaped these two proximate leadership mechanisms independently. To justify its evolutionary significance, we first summarize classic philosophical writings on leadership. We then review the psychological and biological evidence for the distinction and compare the expression of these two leadership types in other species. Finally, we consider how the prestige–dominance model can solve various scientific puzzles, most notably why: (i) expressions of leadership and followership are so different; (ii) followers are attracted to dominance-style leaders despite the risks; and (iii) there is male-biased leadership in **large-scale societies**.

Highlights

Eastern and Western philosophers have long recognized the difference between prestige-style and dominance-style leaders.

Leadership is an active research area in the social, cognitive, and biological sciences, but there has been limited synthesis among these fields. Recognition that there are two leader types can assist with this integration and generate new ideas for a comparative analysis.

Dominance- and prestige-based hierarchies emerge early in development; children use a variety of social and physical cues to learn about different social hierarchies.

Leadership is a crucial but under-recognized force in the evolution of human cooperation, aiding the transition from small-scale to large-scale societies.

Current male-biased leadership systems result, in part, from evolved follower preferences for dominance-style leaders in the face of intense competition within and between groups.

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Box 1. Evolutionary Theories of Leadership Offer a Unifying Framework

Evolutionary theory offers a unifying framework to understand the selection pressures favoring leadership and followership, both of which are supported by theoretical models and data. First, across mammalian societies, leaders, on average, gain a disproportional (direct) benefit from their influence on collective behaviour [2]. For instance, lactating female zebras initiate group movements most often because of their increased physiological needs [9] and high-ranking female hyenas lead in warfare because they have the most to gain from increasing their territory boundaries in their female-dominated societies [96]. Second, some forms of leadership emerge because of kin-directed benefits. For example, costly leadership is favored by indirect benefits to lionesses; individuals lead in protecting relatives from intruders within their egalitarian family groups [97]. In traditional human pastoral societies, some families enforce the conservation of grazing land because their larger herds stand to benefit themselves and their kin the most [98]. Third, reciprocity may compensate leaders who may claim a ‘fee’ for their services through a greater share of the spoils [64,99,100]. Although taxation is typical in more complex traditional societies [101], leaders may instead accrue alternative currencies, such as increased status, power, and political support [102]. The service-for-prestige theory asserts [71] that these reciprocated benefits accrue principally during times of need, such as a food shortage, whereby good leadership (e.g., in hunts) acts as a form of collective insurance [102]. Commodity exchanging of this sort also occurs in non-human groups, including those of monkeys, apes, and social carnivores [19,103,104]. Fourth, effective leadership may act as a costly signal of personal qualities, which motivates followers to reward leaders in terms of deference, friendships, or mating opportunities [105]. In small-scale societies, leadership in hunting and conflict resolution is positively associated with reproductive success [102,106]. Nonadaptive explanations are also possible. Dominance leadership may be a byproduct of another, adaptive trait such as individual dominance motivation; for example, when an alpha provides accidental group-wide benefits by attacking a young, aggressive competitor [104]. Prestige-style leadership may be a byproduct of traits such as boldness, industriousness, intelligence, or motivation for status [26,34]. Finally, multilevel selection, gene–culture coevolution, and niche construction models offer additional evolutionary explanations by arguing that, in the face of strong intergroup competition, leadership enables group members to cooperate more intensely and scale up their activities, resulting in formalized decision hierarchies, division of labor, cooperative norms, and a mix of prestige- and dominance-based leadership systems [17,107].

Confucius versus Machiavelli

In classic philosophical writings about leadership, two different historical perspectives predominate, each of which aligns with the prestige–dominance distinction. One approach, most strongly associated with the work of Confucius, Plato, and the Judeo-Christian teachings of Jesus Christ, sees leaders as being humble, generous, competent, and inspiring [6]. According to words attributed to Confucius, a leader ‘is modest in his speech, but exceeds in his actions’. This position views leaders as role models who exercise influence through possessing superior knowledge, skills, and (outstanding) personal qualities. By contrast, an alternative philosophical tradition – perhaps most strongly associated with Niccolò Machiavelli and the Greek philosopher Xenophon – views leaders as rulers who exercise influence by imposing costs through (the threat of) punishment. In a quote from *The Prince*, Machiavelli advises the ruler that ‘since love and fear can hardly exist together, if we must choose between them, it is far safer to be feared than loved’ [7]. In short, the Confucian–Christian tradition sees leaders as outstanding individuals who lead by example, whereas the Machiavellian tradition sees them as powerful rulers who lead by force, coercion, and manipulation.

We argue that these two opposing views are both partially supported by the available evidence but each one on its own offers an incomplete view into the complex and dynamic processes of leadership. That is, the two constructs suffer from the same problem: they wrongly treat leadership as a single behavioral construct. There are at least two distinct leader prototypes with contrasting expression, functions, and cognitive–developmental pathways (Table 1). Prestigious leaders attract followers by possessing knowledge, skills, and personal qualities that are highly valued by group members and by their generosity in sharing resources (Figure 1A–C). Prestige is often derived from an information asymmetry between leaders and followers. By contrast, dominance-style leaders motivate followers through threat and punishment, both of which are often based on their asymmetry in physical or coalitional strength and power (Figure 1D–F).

Glossary

Charisma: a cue or signal of outstanding personal qualities by which prestige-style leaders can mobilize followers for swift, coordinated collective action.

Coercion: control of the behaviour of others through threat or (physical) force.

Collective action problem: any situation in which multiple individuals would benefit from joining forces to complete a task together, but for which individuals must overcome challenges in coordinating or ensuring a fair contribution to the participation costs of the action (also known as a social dilemma).

Dominance-style leadership: the ability of leaders to motivate followers to behave in ways in which they would otherwise not behave by inflicting costs for not following (irrespective of the benefits for followers).

Dual model of leadership: the assumption that there are two types of leadership with contrasting behavioral expressions, evolutionary functions, and phylogenetic, developmental, and neural pathways.

Followership: a phenomenon in which one individual (the leader) initiates an action and one or more individuals (the followers) engage in behaviors that match or comply with those initiated by the leader.

Large-scale society: a human society comprising more than a few thousand individuals belonging to stratified classes of individuals, each with differential access to and/or control over resources.

Leadership: differential influence on collective behaviour and group decision making through actions evolved or intended to elicit this effect.

Prestige-style leadership: the ability of leaders to influence followers to behave in ways they would not otherwise do by conferring benefits to followers (irrespective of the costs for followers).

Small-scale society: a human society comprising several hundred to a few thousand members in total; often comprises one or a few local communities and usually (but not always) with egalitarian social structures.

Box 2. Conceptual Challenges Regarding Status and Leadership

The biological and social sciences literatures apply different definitions to key concepts such as status and leadership, which impedes cross-fertilization and scientific progress. The human literature equates leadership with power [28], dominance [30], or status [34], for instance, which can be somewhat confusing from a comparative perspective. Dual models argue that human status [34] has three components: (i) priority access to limited resources; (ii) ability to win resource contests; and (iii) relative influence on group decisions. However, only the third aspect – influence on collective behaviour – is relevant to leadership in our comparative framework (Figure I). Not all high-status individuals are therefore leaders, but equally, not all leaders are necessarily high-status individuals. In various species, low-ranking individuals lead group movements and followers benefit from their efforts without it affecting their rank. For example, females are socially subordinate to males in virtually all species of non-human mammals, yet females are most often leaders when it comes to group travel, especially when animals move towards areas with food or water, such as occurs in orcas [11] and zebras [95], respectively. In human societies, status and leadership are often correlated, but this is not always true, especially when leadership comes with considerable personal costs. In small-scale societies, young, low-status men organize war parties, and in large, complex societies low-ranking individuals emerge as charismatic leaders of social movements (think of the child environmental activist Greta Thunberg). Our point is that to conduct comparative, cross-cultural research on leadership, coming up with universal meanings is essential. Our definition of leaders [1,2] as individuals that have a disproportionate influence on group decision making can be applied across taxa, from initiating group movement in baboons or hyenas to organizing war or foraging efforts in human societies. The distinction between prestige-style and dominance-style leadership enables cross-species comparisons that seek to reveal the selection pressures shaping these leader types in human evolution. To biologists, leadership and dominance are two distinct concepts; the latter is a concept largely reserved to describe an individual's ability to win dyadic fights (with a second individual) to gain priority of access to resources [108,109]. Further, prestige-based influence emerges in non-human societies as individuals, regardless of rank, coordinate group movement and followers are attracted to these individuals as they provide coordination benefits (proto-prestige [72]). Finally, to social scientists the prestige–dominance leadership distinction delineates that prestige may not be the only route to human status; dispositionally dominant individuals may be effective group leaders, thereby enhancing their status in groups [18,43,46].

Social hierarchy: a system in which members of a group or society are ranked according to (i) their access to valuable resources and (ii) their influence on others, including on collective decisions.
Status: relative access to limited resources by virtue of winning resource contests and exercising greater social influence.

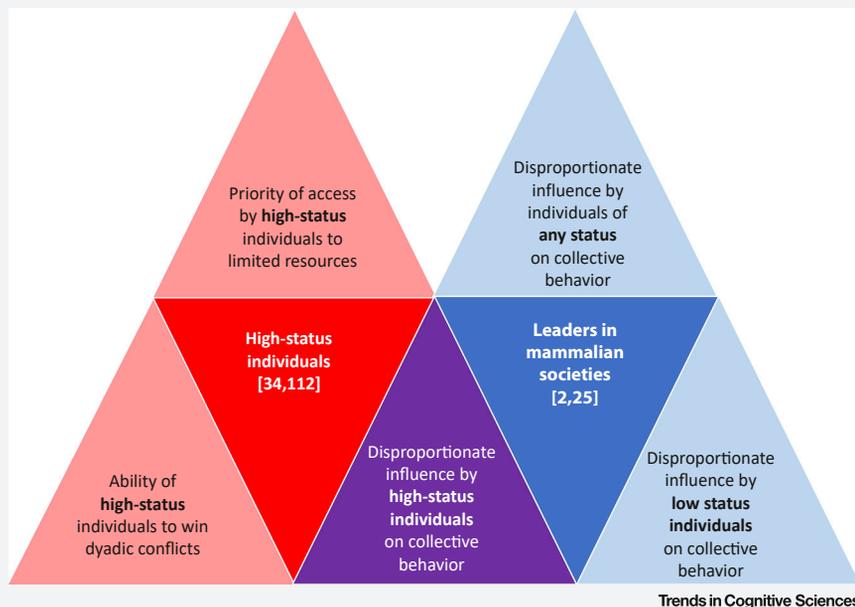


Figure I. The Intersections and Divergences Between the Concepts of Status and Leadership from a Comparative Perspective.

Whereas only the concept of status refers to the ability of high-status individuals to (i) win dyadic conflicts and (ii) gain priority of access to resources, only the concept of leadership describes the ability of individuals of even (i) low status or (ii) mid-status to influence collective behavior. Both concepts include the notion of high-status individuals having a disproportionate influence on collective (group) behavior [2,25,34,110].

Aspect of leadership	Prestige style	Dominance style
Philosophical tradition	Confucius	Machiavelli
Influence	Passive	Active
Mechanism of influence	Provision of benefits to followers (e.g., knowledge)	Inflicting costs on nonfollowers (e.g., sanctions)
Primary evolutionary function	Collective movement, foraging	Conflict resolution, warfare
Nature of decision-making hierarchy	Relatively flat, domain specific, based on expertise	Relatively steep, more generalized power
Source of deference	Information asymmetry	Power asymmetry
Followers	Active, respectful	Passive, fearful
Key emotional affiliations between leaders and followers	Primarily positive affect (liking, love, admiration, identification)	Mix of negative affect (anger, fear) and positive affect (respect, relief)
Role in group	Role model	Alpha
Phylogenetic history	Hunter-gatherers, non-human foraging animals	Primate dominance hierarchy negotiation
Potential costs for followers	Risk of coordination failure, difficulty delegating and scaling up groups	Risk of exploitation, succession problems

Table 1. Differentiating between Prestige-Style versus Dominance-Style Leadership: Mechanisms, Functions, History, and Phenotypes

The historical distinction between the two types of leadership is derived from the evolutionary functions of each. Non-human animals often follow knowledgeable or motivated leaders by following those who move first to a valuable resource (e.g., food patch, water) or away from danger [8]. In many cases, experienced individuals lead collective movements to new foraging grounds, such as elder females (matriarchs) in orca whales and African elephants (Figure 1). Low-ranking individuals also regularly influence collective decisions, emerging as leaders by initiating and coordinating group movements. For example, females are socially subordinate to males in virtually all species of non-human mammals, yet lactating females are most often leaders when it comes to movements (e.g., zebra) [9]. In baboons, low-ranking females influence group cohesion by constraining the movements of even the dominant male and, hence, that of the group [10]. In a role-reversed species, the spotted hyena, in which females are socially dominant to males, low-ranking males lead most often in cooperative hunting; due to their low priority of access to food, males are often hungrier and thus motivated to initiate hunting attempts on their own before being joined by dominant individuals [11]. Thus, in many cases, leaders are often more physiologically motivated to move first to find resources and followers often benefit from gaining priority of access to food once it is located.

Similarly, in small-scale human societies, women – who are often lower ranking than men – can exercise influence over collective activities such as the distribution of food or conflict mediation (female leadership is more likely when societies experience low levels of intergroup conflict) [12]. Although true gender equality – with respect to political influence in group life – remains largely absent from even the most egalitarian **small-scale societies** of humans, women can play a more active role than men in some domains of group life. For example, women of the !Kung more actively criticize norm violators than do men [13]. In other small-scale societies, elder women use their skills, such as in storytelling, to pass on social knowledge and coordinate group rituals among the Tsimane of the Amazon (forager-horticulturalists) [14] and the Agta of the Philippines [15].



Figure 1. Leadership Archetypes Across Mammalian Societies

Images reflect leaders belonging to groups of increasing levels of social complexity, ranging from (i) non-human mammals and (ii) small-scale hunter-gather communities to (iii) large-scale modern societies (from left to right). Prestige-style leader archetypes include: (A) a post-reproductive female resident killer whale in the coastal waters of British Columbia and Washington, (B) a Tsimane woman at a community meeting in the Amazon, and (C) Martin Luther King, Jr motivating civil rights in the USA. Dominance-style leader archetypes include: (D) a male chacma baboon in Botswana (credit: Charles J. Sharp), (E) a male warrior among the Western Dani of New Guinea, and (F) the 45th President of the USA. Photograph credits: Paul Hooper, Charles J. Sharp, Raiyani Muharramah, and Creative Commons.

Prestige-style leaders may not need to actively recruit followers. They can lead by example and thus exercise passive influence in groups [16]. That is, in many cases, followers voluntarily defer to these leaders and may develop emotional connections with them, including a suite of positive feelings such as liking, admiration, passion, and sometimes love, which all contribute to a leader's **charisma** (Box 3). For example, human leaders with outstanding personal qualities such as wisdom, vision, and generosity are bestowed with prestige for the services they provide [17].

By contrast, dominance-style leaders use coercive strategies to exercise influence on followers and the leader-follower relationship is based on a mix of negative emotions such as fear and anger in combination with more positive emotions such as respect, trust, and relief for getting a difficult job done [4,5]. Followers are sometimes attracted to dominance-style leaders because they provide indirect, group-wide benefits by being instrumental in solving **collective action problems**; for instance, mediating in conflicts between group members, dealing with free-riders, and inflicting costs on aggressive outgroups [18]. For example, chacma baboons and spotted hyenas consistently follow the dominant members of the social group despite paying foraging costs for doing so, because maintaining group cohesion is essential for survival [10,19].

Although **dominance-style leadership** is relatively rare in small-scale human societies [20], leaders in these societies often rely on a combination of prestige- and dominance-style tactics [21]. For example, 'Big Men' leaders play a role in enforcing social norms within communities [22] and aggressive young men emerge as warrior leaders [22]. Prestige-style leaders in large-scale societies include Jesus and Mother Theresa, whereas Julius Caesar and Donald Trump exemplify dominance-style leadership [23]. Although the two leadership types can be distinguished relatively easily in non-human animals [24,25], human leaders typically rely on a combination of prestige and dominance tactics to influence group decisions [21]. Teachers or professors, for example, can be inspiring role models for students, but they also grade their course work [26].

Box 3. Hormones as Proximate Mechanisms Explaining Leadership Styles

Hormones are chemical messengers that act on target tissues to trigger a suite of processes, including collective behaviour. At least three major hormones are likely to be involved in mediating the two divergent pathways to leadership: testosterone, cortisol, and oxytocin. Testosterone plays a key role in the formation and maintenance of dominance-style leadership [111,112]. Data suggest a strong relationship between basal testosterone and dominance displays in human and non-human groups [113,114]. In men, high basal testosterone is correlated with holding senior positions in organizations and an authoritarian style of leadership [56,115]. The dual model predicts that testosterone correlates with dominance-style leadership in contexts in which conflict management is crucial but is associated with prestige-style leadership in non-conflict contexts. Causal evidence for divergent patterns comes from studies using economics games. In one study, experimental administration of testosterone to men increased the rates of punishment of low offers and reward of high offers, but also increased prestige-related behaviors when individuals believed their reputations were at stake [116]. Research on college music bands showed increases in testosterone as individuals gain a more prestigious position in their community [117]. High testosterone may also interact with low cortisol to predict leadership (dual hormone hypothesis), but it is unclear whether this interaction primarily affects the prestige or dominance side of leadership [55]. Recent studies on collective hormone profiles find evidence for improved leader–follower cooperation when teams comprise a mix of high testosterone and low cortisol [118]. Although these data offer insights into the unifying role of testosterone in mediating dominance leadership, especially for men, other hormones such as oxytocin and vasopressin may be associated with the more prosocial, prestige style of leadership [119]. For example, increased oxytocin levels in chimpanzees are correlated with periods of intergroup conflict [120] and a suite of prosocial behaviors in humans [121]. Interestingly, oxytocin and testosterone increase concurrently in Tsimane hunters with time away from home, supporting the notion that these two hormones act in concert to shape patterns of leader–follower cooperation in social foraging and parenting [122]. Thus, future research is needed to tease apart the relative roles of these candidate hormones in the context of the dual model of leadership.

Dual-model thinking has had some impact on leadership theory [4,5,17,27]. Leadership studies routinely draw a distinction between personalized power and positional power, which neatly maps onto the prestige–dominance distinction [28]. Distinctions between democratic versus autocratic and participative versus directive forms of leadership also correspond to prestige versus dominance leadership styles, respectively [29]. Parallel distinctions are between transformational versus transactional leadership styles, whereby the first attempts to influence followers, much like prestige, through inspiration and idealized influence and the second through rule enforcement and contingent incentives (akin to dominance). However, the prestige–dominance model differs significantly from these early bimodal leadership theories because, rather than describing what leaders do, it connects these behaviors to deeper evolutionary functions and mechanisms. This allows comparisons between leadership in human and non-human societies and between small-scale and large-scale human societies [2], which broadens the scope of leadership science and advances parsimonious theorizing [1,26]. Further, the dual model brings clarity in debates about the distinction between leadership and management. By setting strategic goals (senior executives) and using contingent punishments and rewards to influence the activities of workers (middle and junior managers), management contains elements of both prestige and dominance styles [30,31].

Prestige versus Dominance Leadership in Humans

The bimodal distinction of leadership and status is based on a wealth of evidence from social–psychological, cognitive, and developmental studies; some of this literature has been reviewed elsewhere [4,5,17,27]. First, although both prestige and dominance are ways to exercise influence over group decisions, leaders differ in style. Some studies find no correlation between prestige- and dominance-style influence as measured through self- and other reports [4]. Other studies show a positive correlation between the two types, suggesting that some leaders use a mix of both styles [32]. There are also different links with personality. Prestige-style leaders score higher on self-esteem, agreeableness, conscientiousness, and need for affiliation [33–35]. By contrast, dominant leaders score higher on traits of aggression, disagreeableness, Machiavellianism, narcissism, and psychopathy – so-called dark-triad personality traits [36].

Prestige and dominance styles of leadership are also marked by different emotional expressions. Prestige is associated with humility and feelings of achievement (authentic pride), whereas dominance is associated with arrogance and feelings of superiority (hubristic pride) [35,37]. Prestige-style leaders also tend to be better liked, more admired, and feared less than dominance-style leaders and receive greater attention from outside observers [35]. Prestige-style leaders are more generous, whereas dominance-style leaders are more assertive [38]. Dominance-style leaders more often use their influence for personal gain; for instance, by excluding rivals for their power position [32,39]. However, dominant leaders prioritize group interests just as much as prestige-style leaders when their power position is securely established and in interactions with other groups, suggesting a mix of individual and group-based motivations [39,40].

Followers also make crucial distinctions between prestige and dominance styles of leadership. In mock election studies with vignettes, when people are asked to vote for a new president of their country, they exhibit a stronger preference for dominant-looking leaders (with masculinized facial cues such as a strong jaw line and/or thin eyes and lips) when their country is at war; conversely, when their country is at peace they prefer a nondominant, more feminine-looking leader [41,42]. Similarly, dominant-looking leaders are preferred when there is a risk of free-riders within the group, but when there is a risk of exploitation by leaders, followers support a nondominant-looking leader [43]. Physically formidable men are seen as better leaders in competitive business organizations [18] and there is initial evidence that dominance-style leaders indeed behave more aggressively in intergroup interactions [42]. Finally, an international study found a stronger tolerance for dominance-style leaders when citizens experienced a high degree of economic uncertainty and drastic measures were needed to restore wealth [44]. Studies of followership reveal important trade-offs in selecting prestige-style versus dominance-style leaders [45]. A prestige-style leader is commonly preferred [42], but when the cost and probability of coordination failure is substantial – such as in intergroup or intragroup conflicts – followers switch to a more dominance-style leader even if it runs against their immediate self-interest [46].

Developmental studies add further to the distinction between the two proximate leadership styles. Young children have a prestige bias; that is, they preferentially learn from expert models and closely affiliate with them [47,48]. Such prestige biases have also been found in nonhumans: Chimpanzees selectively copy experts and high-ranking individuals [49]. In one experiment, children of 21 months watched clips with cartoon characters (in the shape of jellybeans) that were displaying either a leadership-style based on respect or a style based on fear and intimidation of followers [50]. When followers subsequently disobeyed the prestige-style (versus dominance-style) leader, infants stared longer at the scene, suggesting the violation of an internal norm of voluntary deference. Another study showed that children who grew up in harsh environments prefer more dominance-style, authoritarian leaders when they are adults [51]. Thus, young children already have cognitive templates for each leader type. Developmental research further shows that the most popular children are the ones who apply a combination of the two leadership styles, suggesting greater status and influence in groups [52].

Studies of behavioral and neurocognitive mechanisms support the dual model, too. Prestige-style and dominance-style leaders can be distinguished by their postural and vocal cues [53]. Followers show more mimicry when exposed to a prestige leader, whereas cues of dominance elicit behavioral submission ([54] and M. Van Vugt, unpublished). Endocrinal studies show that dominance-style leaders, in both *ad hoc* and formal groups, have higher basal testosterone levels. By contrast, (self-reported) prestige influence correlates negatively with testosterone [55–58] (Box 3). In terms of hormonal reactivity, when dominant leaders are at risk of losing their position of influence, their testosterone and cortisol levels go up, suggesting a readiness to compete [59]. Finally, the neural pathways by which these leaders exert influence on followers may differ. Exposure to dominance-style leaders activates subcortical brain areas like the amygdala and striatum (suggesting upregulation of threat–reward systems), whereas exposure to **prestige-style leadership** is associated with cortical areas like the anterior cingulate cortex and medial prefrontal cortex (indicating an upregulation of social learning and exchange mechanisms) [60,61].

In sum, the difference between prestige-style and dominance-style leadership is based on a host of studies across various branches of psychology revealing associated individual differences in verbal and nonverbal displays, emotions, cognitive processes, and personality correlates. In addition, followers and outside observers (even when they are infants) easily distinguish between prestige-versus dominance-style leaders and apply context-sensitive preferences for each type.

Evolutionary Pathways to Leadership

The recognition that there are two prototypes of leadership raises the possibility that they could have followed separate evolutionary trajectories, solving the Confucian–Machiavellian paradox. Both game theory models on the evolution of leadership and comparative studies suggests that this has indeed happened. Game theory models show that there are different types of leadership in cooperation and coordination games that map neatly onto the prestige–dominance distinction. Leadership can be enacted through being first movers in a game: initiators whose actions, when they are copied by the rest, induce followership through exemplary leadership [16,62]. Models, simulations, and experimental studies show that both leader types facilitate cooperation in groups. One model showed that prestigious Big Men leaders benefit from making a first cooperative move; they attract larger numbers of followers whose contributions increase the payoffs for leaders [17].

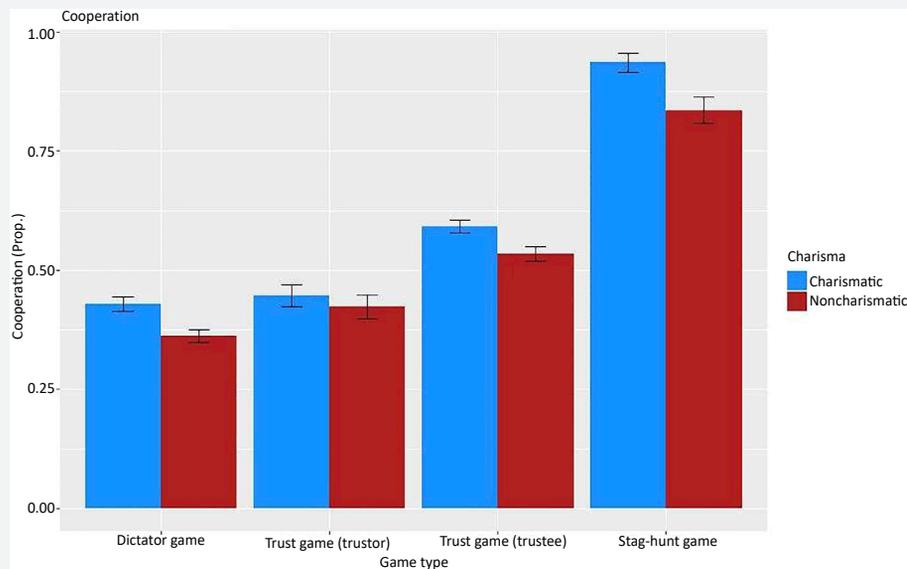
There are also modelling studies showing benefits of dominance-style leadership in solving collective action problems. Groups in which one individual acts as an altruistic punisher of defectors can stabilize cooperation when punishers gain direct or indirect reputation benefits [63]. Modelling studies also show that dominance-style leaders raise cooperation levels in larger groups in which voluntary contributions are exceedingly difficult to obtain [64,65]. By contrast, behavioral experiments on public goods show that the effectiveness of leading by example is limited by leaders' willingness to cooperate [62], their charisma [66], and status position [67] (Box 4). Overall, these studies demonstrate that prestige-style leadership is more effective than having no leadership [68] but a dominance-style leader is superior in enforcing cooperation in public goods games [69]. Coordination-failure risks increase when groups become larger and socially more complex, giving rise to the potential for exploitation by free-riders [70]. Dominance-style leadership solves this problem, but there is a risk of exploitation by leaders. Similarly, dominance leadership creates a second order-free rider problem that needs to be solved: who is willing to pay the costs of punishment? Models predict that leaders, regardless of their style, either gain direct benefits through increased exploitation of a collective good or payments by group members for their services or they benefit indirectly through signaling their qualities to potential mates or allies [71] (Box 1).

Comparing leadership in small-scale human societies with non-human mammalian societies shows interesting similarities and differences between societal types [2]. Comparative data offer ways to integrate seemingly disparate notions of prestige- and dominance-style leadership [72]. For example, a transdisciplinary study [2] sampled several dimensions of leadership for eight human societies (e.g., Ache, Inuit, Shoshone) and eight non-human societies (e.g., elephant, dolphin, chimpanzee) (Box 5). This research quantified the core functions of leadership across societal types in four major contexts, each of which neatly maps onto the prestige–dominance distinction [2]. Results from the comparative analysis of these societal types are consistent with the predictions of the dual model; for an alternative interpretation see [72]. As expected, leaders are generally less powerful and leadership roles are more distributed in the prestige domains (foraging and movements) than in the dominance domains (conflicts within and between groups) [2].

Reviews of leadership in egalitarian hunter–gatherer groups suggest that although prestige-style leadership is generally the norm in these small-scale societies, leader strategies often vary across situations like war versus peace or seasonal changes in group size [73–75]. The best hunters, warriors, and diplomats have greater influence within their domains of competence, but their power is not automatically generalized to other group activities. Leadership requires competence and different people may be competent in different activities. The traditional authority system of the Navajo, for example, included leaders of war, peace (who organized friendly political interactions), hunting,

Box 4. Charismatic Leadership and Human Cooperation

A fundamental challenge in human sociality is to explain how cooperation evolves in large groups despite the free-rider problem. Dominance-style leadership can stabilize cooperation via conflict mediation or punishment of free-riders but this is personally costly. Charisma, a manifestation of prestige-style leadership, provides an alternative, nonpunitive solution. Charismatic leadership is best understood as a cultural adaptation to induce cooperation among a large group of (genetically unrelated) followers, with the primary function to mobilize and expand social networks [123]. Although of great interest to historians, charisma has remained an elusive scientific concept [124]. To St Paul, who coined the term over 2000 years ago, charisma was an inexplicable gift from the divine. For sociologist Max Weber, charismatic leaders possessed ‘supernatural, superhuman, or at least specifically exceptional powers’ [125]. Behavioral scientists have begun to unravel the mystery of this extraordinarily powerful coordination device without recourse to divine intervention. One theory suggests that charismatic leadership evolved as a signal of someone’s outstanding personal qualities to mobilize a large group of followers to solve immediate collective action problems (e.g., organizing group defense against an imminent external threat) [123]. In terms of behaviors, charismatic individuals use a range of verbal (e.g., rhetorical skills offering a compelling identity and vision), paraverbal (e.g., voice pitch), and nonverbal (e.g., body movement) signals to synchronize followers’ emotions and behaviors [126]. Charismatic leaders are seen as entrepreneurs of group identity [127]. The cognitive mechanisms through which charismatic leaders exert influence on followers remain poorly understood. A study exposed Christian and non-Christian follower to speeches from religious leaders that were either suggested to be high in charisma or not [128]. Brain scans revealed deactivation in the frontal executive network when religious followers were exposed to charismatic leader speeches (much like being in a hypnotic state). A different study used clips from charismatic TED talks to gauge their influence [66]. Participants exposed to charismatic leaders cooperated more with strangers across various economic games (Figure 1). Further research should study the contagious emotional and behavioral effects of charismatic leaders on the neural and behavioral mechanisms of followers.



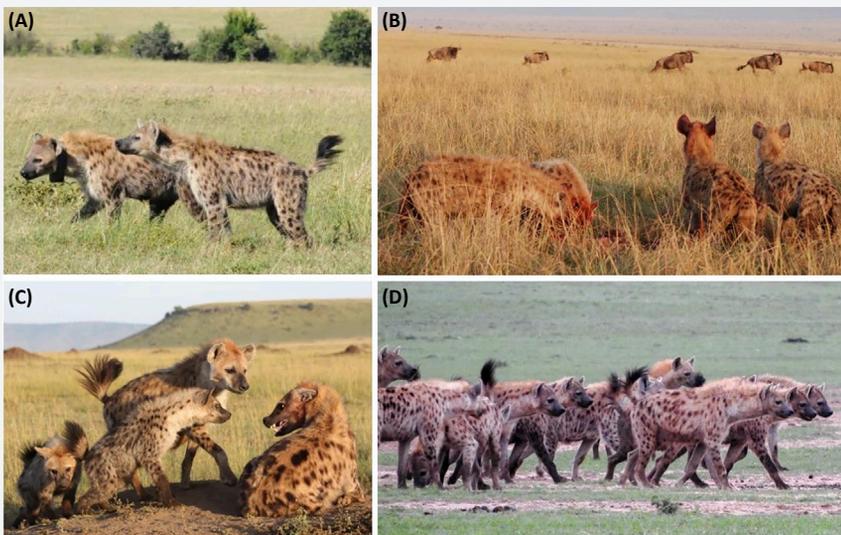
Trends in Cognitive Sciences

Figure 1. Economic Games Suggest That Charismatic Leaders Stabilize Cooperation.

Results from 500 experiments support the role of charismatic leaders in the evolution of human cooperation [66]. In one study, individuals watched a TED talk of a speaker pre-rated as particularly charismatic (whereas a different group watched a TED talk from a noncharismatic speaker). In another study, people were asked to recall an interaction with a particularly charismatic person in their life (versus an acquaintance). After interacting with the charismatic person, participants cooperated more (stag-hunt and dictator games) and were more trustworthy (trust game) [66].

Box 5. Two Leadership Types Across Mammals

Although biologists have produced a substantial theoretical and empirical literature on dominance hierarchies, they have only recently recognized the pervasiveness of leadership in animal groups [8,25,129–131]. Novel theoretical and empirical synthesis between biological and social scientists has yielded exciting new insights regarding the similarities and differences between human and non-human mammalian societies [2,75,95]. Patterns of leadership from these societies (see text for details) reveal various evolutionary paths and contexts of leadership. First, a common framework for studying leadership reveals that multiple species engage in leadership across a common set of ecological situations: (i) collective movement; (ii) food acquisition; (iii) within-group conflict resolution; and (iv) between-group interactions (whether peaceful or hostile). This comparative framework offers new ways to disentangle the evidence for the dual model, offering examples of both styles across societies of human and nonhuman mammals. Beyond this, it is common within each mammal species, as occurs in the female-dominated societies of spotted hyenas, that leadership styles vary across domains (Figure 1). Across and within species, prestige styles emerge most often during collective movements and foraging. In these contexts, one individual (the leader) simply initiates movements or foraging and other group members (followers) follow the initiator. The prestige leaders often possess superior knowledge or the greatest physiological requirements; reproductive or post-reproductive females often lead group travel [25,95]. By contrast, physical power, strength, and dominance rank (for hierarchical groups) strongly predict leadership styles during within- and between-group conflicts; males are particularly likely to lead in this latter context [12,75,91]. These findings support the notion that natural selection has conserved the potential for mammals – within and across species – to emerge as leaders with attributes reflecting either a dominance or a prestige style. The generality of these context-dependent patterns across mammals (including humans) offers an understanding of the flexible nature of leadership [132,133]. These new insights are particularly relevant with respect to the recent global shift towards dominant, authoritarian leaders in human societies, indicating that these trends and potential barriers to access (particularly for women) are by no means fixed and that prestige-style leaders may readily emerge in the appropriate social contexts.



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Figure 1. An Example of Domain-Specific Leadership Styles Within a Species.

In a social carnivore – the spotted hyena – followers prefer the influence of prestige-style leaders on collective (A) movements [25] and (B) foraging [11,134], but dominance-style leaders on (C) within-group conflict resolution [24] and (D) between-group warfare [96]. This fluidity in leadership roles and follower preferences is a common feature of many mammalian societies, including those of humans. Photograph credits: Kay Holekamp, Kate Shaw, and Jack Grady.

medicine (shamans), and ceremonial songs [76]. In these societies, there is active opposition against aggressive individuals and when they become too powerful, there are levelling mechanisms in place curtailing their power [77]. Gradual sanctions, from gossip and ridicule to exclusion and execution, are applied to deal with domineering individuals, usually males, as they undermine the egalitarian ethos of these small-scale societies. One of the major causes of homicide is the execution of excessively aggressive, intimidating men.

Explanations for the Persistence of Leadership Preferences

Having solved the Confucian–Machiavellian paradox, two outstanding puzzles remain. The first concerns the prevalence of dominance-style leadership in large-scale societies (e.g., presidents, managers, officers). If dominance was actively selected against in ancestral egalitarian, small-scale societies, why do dominance-style leaders persist (and people voluntarily defer to them)? One possibility is that dominant-style leaders benefit personally from their actions. This notion has been supported by social–psychological studies showing that leaders with a dominance motivation take more than their fair share of collective resources [32,40].

A second hypothesis to solve the dominance paradox is that dominance-style leaders are compensated for their role in enforcing social contracts within egalitarian groups. Examples include the use of levelling mechanisms such as punishment and homicide, which are inherently aggressive actions [78]. Dominance-style leaders who use their physical formidability and aggressive disposition to coordinate punishment against overbearing people is a valuable public good. Through their efforts, the second-order free-rider problem associated with collective punishment could be solved [18]. The availability of levelling mechanisms in small-scale societies, associated with the reversal of the dominance hierarchy, created a niche for dominance-style leaders to display aggression, especially towards antisocial males, tolerated by the rest of the group [20,77]. Part of the leader role may have been to build formidable coalitions against aggressive males [71]. In support of the punishment hypothesis, execution is a human universal, which suggests it evolved before humans migrated out of Africa 60 000 years ago. Experiments further show that, although punishers in public goods are not as well liked as nonpunishers, punishers are considered more trustworthy and group serving [79]. This points to an adaptive solution by which dominant leaders gain status benefits from taking on punisher roles. Indirect benefits may accrue by signaling personal qualities to potential allies or sexual mates; for instance, offering protection to women against sexual harassment [80].

Finally, dominance-style leaders may gain status benefits by inflicting costs on members of outgroups through displaying aggression in combat [81]. In favor of the warfare hypothesis, rates of war mortality and genetic differentiation among hunter–gatherer groups have been estimated to be sufficiently high for selection to favor these traits [82]. Research on small-scale societies involved in raiding and warfare shows that particularly brave warriors reap reproductive benefits from their dominant-style leadership displays [83]. Note that this counts only for warriors making a reasonable judgment about the costs and benefits of raiding; those that do not – the zealous warriors – suffer in terms of survival and reproductive costs [84]. Studies in large-scale societies also show a preference for dominance-style leaders in intergroup competition [41–44]. Archival data on World War II veterans (in the USA) suggest reproductive benefits for war heroes; recipients of the Congressional Medal of Honor fathered more children than veterans who did not receive such an honor. Possible sexual selection for dominant-style leadership displays in combat is also supported by evidence from vignette studies showing that men displaying such bravery are selectively preferred as mates [85].

The second remaining puzzle solved by the dual leadership model is the current male bias in modern society's leadership structures (Box 5). Women remain under-represented in top leadership positions in virtually every discipline. This is true in business, education, and science [86,87]. Women hold fewer than 6% of CEO positions at the S&P 500 companies in the USA and 20% of seats in the parliaments of democratic states around the world (<http://www.catalyst.org/knowledge/women-ceos-sp-500>). Gender biases and stereotypical social role beliefs may offer proximate explanations for this discrepancy, but the dual model offers a complimentary, evolutionary explanation for the glass ceiling for

women leaders. Research on leadership styles, including several meta-analytical studies, suggest that men lead in a more directive, authoritarian manner whereas women are more coaching and participative [88,89]. Men also score considerably higher on dark-triad and social-dominance traits [36]. These differences can be explained by both cultural norms and the forces of sexual selection operating on men to use dominance leadership styles to compete intrasexually [35].

Comparative studies of nonhumans suggest that females, although they have lower status than males, are more likely to emerge as prestige-style leaders, taking on leadership roles in the domains of collective movement and foraging due to greater knowledge and motivation. By contrast, males are more likely to emerge as dominant leaders in mixed-sex groups, managing conflicts within and between groups through the threat of force [90]. These differences partly result from: (i) differences in physical formidability; (ii) age biases in leadership, as female mammals are, on average, older than the males; and (iii) the impact of reproductive physiology – pregnant and lactating females are hungrier earlier [1]. Studies of leadership in small-scale human societies show that men are more likely to take on political leadership roles than women but that women exercise more political influence in small-scale than in large-scale societies [36,89].

As human societies became larger and socially more complex, particularly in the context of intense agriculture, collective action problems and accompanying conflicts of interest intensified and therefore the degree of intergroup and intragroup conflicts has increased sharply [91–93]. These pressures produced cultural adaptations for dominance-based leadership systems, whereby first headmen emerged as dominance-style leaders in small-scale societies. This was followed by more formalized authoritarian leadership structures (e.g., chiefs, kings, presidents, CEOs) aimed at galvanizing cooperation in ever-larger, more genetically diverse communities. At the same time, these formal institutions ensured that leaders could resist the levelling strategies of followers that were so effective in curtailing their powers in small-scale societies. Michels ([94], see pp. 70–71) observed: ‘It may be enunciated as a general rule that the increase in the power of the leaders is directly proportional with the extension of the organization’. Prestige-based leadership systems offer limited room for group expansion as they are not as easy to scale up as dominance systems, in which layers can be easily added. Furthermore, unlike dominance-based leadership, prestige cannot be easily delegated from one leader to another.

Concluding Remarks and Future Perspectives

The idea that leadership comprises two main types has long been acknowledged in the humanities and social sciences, yet a discussion of the evolutionary functions and origins of leadership is largely missing from the literature (but see [1,4,27]). This omission is surprising considering the behavioral, cognitive, ontogenetic, and phylogenetic evidence that richly justifies the distinction between two leadership types operating in groups. We believe that the prestige–dominance model of status and hierarchy can be usefully applied to distinguish between two proximate styles of leadership. Much remains to be learned about this dual model, however, particularly regarding neural mechanisms, developmental factors, and sex differences in leadership (see Outstanding Questions).

First, the neurobiology of these different leadership types is not so well understood (Box 3). Operating with a prestige or a dominance style may have very different neural and endocrinal effects on leaders. Exposure to different leader styles may also activate different neural mechanisms in followers, with prestige leaders possibly affecting areas of the brain associated with social learning, theory of mind, and critical processing and dominance-style leaders affecting deeper, subcortical areas associated with threat, fear, anger, and reward [61].

Second, further animal studies could help elucidate sex differences in leadership style by systematic mapping in multimale multifemale groups in the domains that males or females are more likely to lead and the extent to which gender equity exists in other domains. Human studies could focus on organizations that are relatively smaller and flatter in hierarchy (e.g., schools, start-ups) to see if there is a more equal participation of women in leadership roles. Regardless of these patterns, it is also

Outstanding Questions

- Are individuals who use a combination of prestige and dominance styles more effective leaders? Do they gain status more easily?
- Does exposure to prestige- versus dominance-style leaders activate different brain regions in followers, especially in cortical versus subcortical regions?
- Do prestige-style leaders induce greater neural synchronization in followers than dominance-style leaders and does this facilitate social learning?
- How do the social networks of prestige-style and dominance-style leaders differ?
- What roles do oxytocin and vasopressin play in leader–follower emotional bonding?
- Does the prestige–dominance distinction account for sex differences in leadership styles across species and can it explain the glass ceiling for women leaders in current society?
- What social–ecological factors drove the transition from prestige-based leadership in small-scale societies to dominance-style leadership in large-scale societies?
- Is the social–ecological niche for dominance leadership best explained by the risk of coordination failure in the face of within- or between-group conflict?
- Do infants distinguish between prestige-style and dominance-style leadership for different purposes (collective movement versus conflict management)?
- Are teams more effective when leadership styles match follower needs (e.g., need for protection, information)?

important to acknowledge that humans are cultural innovators able to create to some extent the kinds of social hierarchies – and to choose the types of leaders – that we value, regardless of our evolutionary history [95]. Third, the different hypotheses proposed to explain selection for dominance-style leadership could be tested in the context of both small-scale societies and modern organizations. For instance, the warfare hypothesis predicts the emergence of dominant leaders in competitive business contexts, whereas the punishment hypothesis predicts a role for dominance-style leaders as ‘police officers’ mediating in internal conflicts, tackling free-riders, and enforcing social norms.

Finally, recognition of a **dual model of leadership** provides an answer to an old philosophical debate about the nature of leadership as either setting the right example or being an effective ruler. Due to a unique evolutionary legacy of being primates with a relatively steep dominance hierarchy and hunter-gatherers with a flatter, more egalitarian social hierarchy, humans have been able to create large cooperative communities around inspirational, charismatic, prestige-style leaders who are backed up by (physical) force and coercion whenever there was a substantial danger of coordination failures in the face of intra- or intergroup conflicts.

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