

BRIEF CONTENTS

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1

Human Behavior in Collective Action

1.1 Objectives, Outcomes, and Obstacles in Collective Action

Collective action, the pursuit of a goal or objective by a group of individuals, has been a fundamental aspect of human societies throughout history. Typical goals of collective action include providing tangible resources or intangible rewards at lower costs and protecting resources susceptible to overuse, which require collective management for long-term sustainability. Ranging from small-scale societies to complex modern civilizations, collective action has taken various forms, including economic, political, scientific, religious, and conflict-related endeavors.

For example, in early human societies, collective hunting was crucial for survival. This cooperative effort required strategic planning and role distribution, showcasing early forms of organized group behavior. The shift to agriculture in Neolithic times was also a collective endeavor, involving the sharing of knowledge about crop cultivation and animal husbandry, as well as communal work in planting and harvesting. Collective action was critical in conflicts with neighboring groups. Similarly, the construction of monumental structures like the megaliths in Göbekli Tepe in Turkey, the Egyptian pyramids, the Great Wall of China, or mounds in Cahokia required immense collective effort, organized labor, and resource allocation. The ancient Greeks and Romans engaged in political collective action, such as the Athenian Assembly, where citizens collectively made decisions, and the Roman forums, where public discourse shaped political outcomes. Rituals and ceremonies also played a significant role in collective religious activities, shaping both social and political landscapes. Contemporary examples include the civil rights movement, environmental campaigns, and political protests, where collective action has led to significant societal changes. Modern scientific endeavors, like the International Space Station or the Large Hadron Collider, represent collective action

in the scientific community on a global scale. Natural resources like forests, water bodies, and the atmosphere, which are susceptible to overuse, require collective management for sustainability. Similarly, challenges like global climate change or pandemics demand extensive collaboration among diverse entities worldwide.

History shows that collective action has played pivotal roles in driving significant societal change, whether through political revolutions, social justice movements, or processes of democratization. These actions can empower marginalized or minority groups by providing them with a platform to amplify their voices and influence policies and practices that impact their lives, as demonstrated by various civil rights movements. Collective action allows individuals and communities to accomplish goals beyond the reach of any single person. Working together, groups can surpass individual efforts through the “economy of scale,” which boosts productivity and cuts costs. Pooling resources, skills, and knowledge leads to more efficient and effective results. Additionally, engaging in collective action strengthens social ties and builds a sense of community. Modern-day collective actions encompass climate change protests and movements, online activism, social media campaigns like the #MeToo movement, digital consumer boycotts against unethical corporate practices, and crowdfunding efforts supporting various initiatives or individuals.

However, the same mechanisms of collective action have been harnessed to perpetrate heinous acts of violence and oppression, such as the slave trade, genocides, and wars. Understanding the motivations for conformity and the dynamics of authority in these contexts is essential. This knowledge not only helps in recognizing the early signs of harmful collective behavior but also in developing strategies to prevent and counteract these actions effectively.

To ensure the success of collective efforts, multiple challenges must be addressed. The free-rider problem, where individuals reap the benefits of others’ efforts without contributing, is a major obstacle that can weaken motivation and participation. Effective coordination and communication are crucial but can be difficult, particularly in large groups. Conflicts arising from varying interests and goals within the group can hinder unified action and consensus. Strong, transparent leadership is vital for guiding collective efforts, yet challenges such as power imbalances and poor management can obstruct progress. Moreover, collective actions, especially those efforts seeking social or political change, often encounter opposition from influential groups or institutions. Overcoming these challenges is key to leveraging collective action for societal improvement. An understanding of the common challenges encountered by collective action can be strategically utilized to mitigate those that have detrimental effects on individuals and societies.

Understanding collective action as a form of cooperation benefits from examining it through multiple perspectives, including insights from our evolutionary past.

1.2 Biological Roots of Human Sociality

Humans have always lived in groups, a common trait in the animal kingdom with significant implications for individual fitness and other biological characteristics. This group living fosters cooperation and mutual aid, bringing considerable benefits, as seen at various biological levels (Darwin, 1871; Krause & Ruxton, 2002; Kropotkin, 1902; Trivers, 1985). Cooperation in animal groups facilitates the division of labor and economies of scale, improving efficiency in provisioning, defense, and offspring rearing. A key mechanism against free-riding in biology is genetic relatedness (Frank, 1998; Hamilton, 1964; Lehmann & Keller, 2006; Rousset, 2004). Genetic relatedness refers to the degree of genetic similarity between individuals in a population. By helping genetically similar individuals, organisms indirectly enhance the propagation of their own genes, even if they do not directly benefit from cooperation.

Besides cooperation, an additional advantage of group living is that it enables learning beneficial behaviors from group mates. Studies show that imprinting, imitation, and animal cultures are prevalent among group-living animals, enhancing survival and adaptation (Whiten, 1992, 2021; Whiten et al., 1999). Group living requires advanced cognitive abilities to navigate complex social dynamics (Alexander, 1990; Dunbar, 1998, 2009; Holloway, 1973). Enhanced social cognition is essential for managing relationships, alliances, and rivalries within a group. This need for sophisticated social intelligence likely contributed to the evolution of larger, more complex brains. Individuals living in groups might use sophisticated Machiavellian strategies, including deception, manipulation, alliance formation, and exploitation of the expertise of others for personal benefit and collective purposes. These strategies, which involve influencing others' perceptions and actions, reflect the complex balance of cooperation and competition in group dynamics. Physical, physiological, and cognitive differences among individuals often result in dominance hierarchies (Drews, 1993). In these structures, dominant members can enforce their preferences, possibly leading to submissive behaviors in others. Additionally, group living sets the stage for conflicts between neighboring groups over resources like territory and mating opportunities (Braga Goncalves et al., 2022). Such conflicts can drive kin selection or cultural group selection, leading to the elimination or assimilation of less competitive groups. All of the above factors have been relevant for our species.

Biological research convincingly demonstrates that organisms use a wide array of pathways to adapt to their environment, thereby enhancing their viability, survival, reproductive success, and mating opportunities (Darwin, 1859; Futuyma, 1998). Over the past couple of decades, research on human origins has reached a consensus that our ancestors embarked on an evolutionary path characterized by increased reliance on cooperation, social learning, and traits already well-developed in our primate predecessors, along with an emphasis on cumulative culture (Henrich, 2015; Richerson & Boyd, 2005; Richerson et al., 2021). In humans, social learning evolved into a sophisticated system, while culture accumulated over time, growing in scale, complexity, and diversity. Unlike the largely observational social learning in other animals, humans developed intentional teaching, where skilled individuals actively facilitate learning (Fogarty et al., 2011). Together, social learning and teaching led to over-imitation, where both children and adults copy actions—whether relevant or not—from others (Hoehl et al., 2019, p. 90). Such learning and culture fostered the rapid spread of beneficial innovations across individuals and groups.

Cooperation in humans expanded beyond genetic kinship, allowing for risk buffering, cost reduction, and access to new resources through economies of scale. This expanded cooperation involves not only genetically related individuals but also those sharing symbolic markers like accents or rituals, enabling collaboration on a much larger scale (Boyd & Richerson, 1987; Moffett, 2022).

Research suggests that the Pleistocene's unstable environment played a pivotal role in making culture and cooperation vital in human evolution. Fluctuating conditions favored social learning over genetic adaptation and individual learning, as it offered a more flexible response to environmental changes (Potts, 1996; Richerson & Neco, 2014; Richerson et al., 2005; Richerson & Boyd, 2013; Richerson et al., 2021).

Cognitively complex animals, such as chimpanzees, elephants, and dogs, not only experience a range of emotions but are also influenced by the emotions of their peers (Darwin, 1872; de Waal, 2016a). This emotional awareness is particularly pronounced in humans, where innate social emotions evolve into a sophisticated sense of morality. This moral framework forms the foundation for social norms, guiding a broad array of social interactions and ethical behaviors (de Waal, 2016a; Richerson et al., 2021). The expansion of innate emotions into moral principles is a key aspect of human social dynamics, influencing everything from individual decision-making to larger societal structures and dynamics.

Central to understanding human evolution is the concept of gene-culture coevolution, which refers to the reciprocal influence and adaptation between

genetic traits and cultural behaviors within a population over time (Boyd & Richerson, 1985; Cavalli-Sforza & Feldman, 1981). A prime example of this is language, a trait likely resulting from the interplay between biological evolution and cultural developments. Language not only simplified cooperation but also allowed for the transmission of knowledge, preferences, and beliefs. The origins of language, involving the coevolution of speech organs and culturally transmitted elements like syntax, remain a mystery, but it was clearly a crucial step in our evolution.

Self-domestication has been proposed as an additional key factor in human evolution, altering our physical, psychological, and behavioral traits (Boehm, 2012; Hare, 2017; Wrangham, 2019a,b). This concept was initially motivated by observations of some anatomical resemblances between humans and domesticated mammals, suggesting that over the past 300,000 years, *Homo sapiens* has undergone increased selection against reactive aggression compared to other *Homo* species. This selection pressure against reactive aggression explains various physiological, behavioral, and cognitive traits in humans, including the egalitarian male hierarchies found in mobile hunter-gatherer societies. The process of self-domestication, potentially driven by partner choice or the removal of aggressive individuals or their offspring, has led to diminished aggression and enhanced adherence to group norms (Kimbrough et al., 2021; Sánchez-Villagra & van Schaik, 2019). A key feature of animal domestication is a reduction in brain size, likely due to a decreased need for survival skills (Zeder, 2012). In contrast, as discussed above, humans evolved larger brains over time, arguably driven by the unique demands of complex social living, cultural development, and language.

Compared to our closest relatives, humans have an extended childhood and significant involvement of non-parents in child-rearing. These factors likely reinforced docility and obedience in children and, later, conformity in adults (Bouchard, 2009; Chen et al., 2022). The advent of language further transformed the means of influencing behavior, thoughts, beliefs, and attitudes, marking a significant leap in human social evolution.

As a result of these evolutionary factors, humans have become a highly cooperative species (Bowles & Gintis, 2011; Richerson et al., 2021), with behaviors and beliefs especially susceptible to social influence (Richerson et al., 2021).

1.3 Forces Involved in Collective Action

The human characteristics discussed above play a significant role in general human motivation and, specifically, in the success of collective action. In the following sections, I explore diverse factors that shape human motivation,

such as material costs and benefits, attitudes, personal norms, morality, social influence, cognitive processes, belief change, and between-individual variation.

1.3.1 *Human Motivation*

The question of what motivates human behavior has fascinated thinkers from Plato, Aristotle, and Confucius to contemporary scholars (Seabright et al., 2021). Selfish concerns for self-preservation, reproduction, and power played important roles in various theories, e.g., those by Hobbes, Locke, and Rousseau. Aristotle's view of humans as social animals highlights the role of social influence. Darwin suggested that group selection at the tribal level in humanity's distant past favored the evolution of prosocial emotions such as sympathy, loyalty, and patriotism.

Human motivation has been extensively studied in social psychology. An influential theory by Maslow (1943; 1970) is based on two important ideas: (a) that there are multiple and independent motivational systems (motives) and (b) that these motives form a hierarchy in which some motives have priority over others. Specifically, in Maslow's hierarchy of needs, the following are fundamental: physiological (e.g., air, water, food, sleep, sex, etc.), safety (protection and stability), love and belonging (intimacy, friendship, family, etc.), esteem (respect from self and others, strength, freedom, etc.), and self-actualization (which is "the desire to become more and more what one is, to become everything that one is capable of becoming" (Maslow, 1943, p. 383)).

Building on Maslow's theory, several additional factors contributing to human motivation have been proposed. A particularly significant one is the need to reduce cognitive dissonance—a state of mental discomfort experienced when a person's attitudes, beliefs, or behaviors are in conflict (Festinger, 1957). Cognitive dissonance can be reduced by changing behavior, changing beliefs, or by seeking out information that supports existing beliefs or behaviors while ignoring contradictory information. Cognitive dissonance plays an important role in the mathematical models considered later in the book. Other motivational factors include the need for self-enhancement (Alicke & Sedikides, 2009), the need for social belonging (Baumeister & Leary, 1995), and the need for closure (Kruglanski & Webster, 1996).

Kenrick et al. (2010) connected Maslow's hierarchy with ecological life-history theory (Stearns, 1992), a branch of evolutionary biology that studies the pattern of survival, growth, and reproduction in an organism's life. They argue that recurring behavioral patterns likely evolved through natural and sexual selection. Their updated hierarchy includes immediate physiological needs, self-protection, affiliation, status/esteem, mate acquisition, mate

retention, and parenting, emphasizing the importance of genetic and ecological factors in shaping motivation.

The importance of cultural context in understanding human motivation is emphasized by Heine (2007); Kesebir et al. (2010), among others. While certain motivations are universally understood and experienced, their significance and prioritization vary across cultures (Kesebir et al., 2010). This variation arises from individuals becoming attuned to the specific contingencies associated with these motivations within their cultural environments. For instance, in contexts where fitting in is more beneficial than standing out, individuals are likely to develop a stronger motivation to conform. If such contexts predominate, this conformist orientation becomes habitual and prioritized. Additionally, if individuals are consistently surrounded by others with a similar focus on conformity, this behavior can evolve into a cultural norm, influencing general attitudes towards fitting in. Therefore, cultural differences lead to divergent motivations among people from different cultures, illustrating the interconnectedness of culture and individual psychology (Heine, 2007; Kesebir et al., 2010).

I will next discuss the various factors influencing human motivation and how they relate to Maslow's hierarchy of needs. It is crucial to note that the categories discussed below are interconnected, rather than distinct and independent. Most of these factors are included in the mathematical framework developed later in the book.

1.3.2 *Material Costs and Benefits*

Collective action is often motivated by the goal of enhancing material benefits and reducing costs for group members. However, conflicting individual interests and free-riding—a phenomenon reflecting the tension between self-interest and collective goals—complicate these efforts, as previously discussed. Naturally, the larger the expected net benefits, the more individual efforts in collective action are expected. Material benefits are crucial for satisfying physiological and safety needs in Maslow's hierarchy. Material costs and benefits are the focus of game-theoretic studies of human behavior to be considered in the next chapter.

1.3.3 *Attitudes, Personal Norms, and Morality*

People differ in their attitudes, personal norms, and moral values that affect their decision-making. These dispositions do not necessarily align with individuals' perceptions of the social environment or the perceived costs and benefits of actions.

Attitudes are psychological tendencies expressed by evaluating a particular entity with some degree of favor or disfavor (Albarracín & Shavitt, 2018; Bohnet & Dickel, 2011). They are typically formed based on personal experiences, emotions, beliefs, and learned information. Attitudes encompass feelings, beliefs, and behavioral inclinations toward specific objects, people, events, or ideas.

Personal norms are internal standards and rules of behavior that individuals feel obligated to follow (Campbell, 1964; Cooter, 2000; Etzioni, 2000; Henrich & Ensminger, 2014; Wrong, 1961). These norms are self-imposed and represent the individual's perception of which behaviors are appropriate or necessary in certain situations.

Personal norms develop from a combination of social, psychological, and cultural factors. For instance, they may arise through personal reflection, moral beliefs, or individual experiences. They can emerge from an individual's evaluation of how different actions impact various components of biological fitness (Sznycer, 2022) or evolve over an evolutionary timescale through fitness-maximization processes involving genetic relatedness (Akçay & Cleve, 2021; Alger & Weibull, 2013a; Alger et al., 2020).

Personal norms that originate from societal or cultural norms (discussed below) and become deeply integrated into an individual's belief system are known as internalized norms (Gavrillets & Richerson, 2017; Gintis, 2003b). Thus, all internalized norms are personal norms, but not all personal norms stem from societal internalization. Additionally, personal norms can emerge from a desire to conform with one's group or motivated by the need for accuracy in uncertain contexts (del Rosario et al., 2024).

Moral values are the fundamental beliefs about what is right and wrong, guiding moral judgments and ethical decisions. Values can be understood as attitudes toward abstract concepts. While attitudes and personal norms vary widely among individuals, moral values tend to be shared more broadly, sometimes universally. Values are generally more stable, deeply rooted in a person's character, and influenced by cultural, religious, and philosophical traditions.

The "Moral Foundations Theory" (Haidt, 2015) plays a significant role in psychology as a framework for understanding the underlying dimensions of human moral reasoning and social behavior. This theory posits that there are several innate moral foundations that shape human moral reasoning (Haidt, 2015). These include care/harm, which involves concern for the well-being of others and an aversion to causing harm; fairness/cheating, which pertains to justice, reciprocity, and fairness in social interactions; loyalty/betrayal, involving loyalty to one's group or tribe and an aversion to betrayal; authority/subversion, which encompasses respect for authority figures and social hierarchies and an aversion to disobedience or subversion;

and sanctity/degradation, which involves reverence for sacred objects, places, or ideas, and an aversion to impurity or contamination. Haidt argues that individuals vary in the extent to which they prioritize these moral foundations, and these differences contribute to variations in moral beliefs and values across cultures and political ideologies.

Whereas the Moral Foundations Theory examines the psychological roots and cultural variations of moral intuitions across diverse domains, the “Morality-as-Cooperation” theory adopts a functionalist perspective, emphasizing how moral behaviors address specific cooperative challenges (Curry et al., 2019, 2022). It identifies seven cooperative behaviors viewed as morally good, including helping family and group members, reciprocating, showing bravery, deferring to superiors, fairly dividing resources, and respecting property rights. This theory is supported by studies across 256 societies (Alfano et al., 2024). Research also indicates that morality might stem from a “moral core”—basic abilities present from infancy that help decipher morally relevant behaviors, influenced by group affiliations (Woo et al., 2022). Personal predispositions and moral principles, shaped by culture and personal experiences (Kelly, 2020), can remain consistent or evolve due to social changes. While some guide individual behavior, others may be overridden in certain situations.

ATTITUDES AND PERSONAL NORMS IN MASLOW’S HIERARCHY OF NEEDS

Moral behavior can fulfill various levels of needs in Maslow’s hierarchy. Moral codes often emerge as a means to ensure the safety and well-being of oneself and others (physiological and safety needs). Moral behaviors like empathy, cooperation, and altruism are crucial for building and sustaining social bonds (belongingness and love needs). Acts of integrity, justice, and social responsibility can enhance an individual’s self-esteem and reputation (esteem needs). Ethical considerations often drive the pursuit of goals, creativity, and problem-solving at this level (self-actualization needs).

1.3.4 *Social Influence*

Human behavior, particularly in the realm of collective action, is influenced by a myriad of social forces. These encompass conformity to group behaviors, rewards and sanctions for adhering to or violating social norms and institutions, the sway of social identity, and the impact of authority figures and institutional structures. Chapter 3 will explore theoretical work on the evolutionary origins of humans’ susceptibility to social influence, while Chapter 4

will examine simple mathematical models that capture the dynamics of social influence within a single generation.

CONFORMITY TO GROUP BEHAVIOR

Numerous studies in social psychology and experimental economics demonstrate that human actions and decisions are heavily influenced by others' actions (Cialdini & Goldstein, 2004; Song et al., 2012). A classic example is Asch's experiments on conformity, which revealed that individuals often conform to a majority group, even against obvious reality, to avoid going against group consensus (Asch, 1951; Bond & Smith, 1996; Franzen & Mader, 2023; Jacobs & Campbell, 1961). These experiments show that people often give knowingly incorrect answers to align with a group's incorrect consensus.

Individuals not only conform to the actions of others but also behave according to their perceptions of others' expectations. In particular, people find it uncomfortable to hold beliefs different from those around them (Golman et al., 2016). This suggests the importance of second-order beliefs—beliefs about others' preferences or anticipated actions—in shaping our own behaviors and preferences.

Conformity to group behavior can lead to spirals of silence, pluralistic ignorance, and cultural evolutionary mismatch. Spirals of silence occur when individuals who perceive their opinions as a minority remain silent out of fear of social isolation, reinforcing the dominance of the majority view (Noelle-Neumann, 1974). For example, employees who disagree with a workplace policy may stay quiet, mistakenly believing their dissent is unpopular, leading to further silence and perceived consensus. Pluralistic ignorance arises when most group members privately reject a norm but assume others accept it, causing the norm to persist (O'Gorman, 1986; Shamir & Shamir, 2007), as seen in East Germany before the fall of the Berlin Wall, where many wrongly believed they were alone in opposing the Communist regime. Cultural evolutionary mismatch happens when behaviors or norms, once adaptive, become maladaptive due to environmental or social changes, yet persist due to conformity (Gelfand, 2021; Nunn, 2022a,b), such as the tradition of child marriage. In later chapters, I will introduce mathematical models to explain how these dynamics arise, persist, and shape collective behavior and decision-making.

SOCIAL NORMS

The definitions of social norms vary by discipline (Bicchieri, 2006; Nyborg, 2018; Young, 2008, 2015). Social psychology distinguishes between descriptive norms, which are perceptions of common behaviors, and injunctive

norms, which are expected behaviors in certain situations, often upheld by social approval or disapproval (Cialdini et al., 1990). For example, hand-shaking is a common descriptive norm, while refraining from littering is an injunctive norm, often maintained through the threat of social disapproval and internalized values. In contrast, “conventions” align individual and community interests, sometimes being legally mandated, like driving on the right side of the road in the US and continental Europe (Bicchieri, 2006; Lewis, 1969; Young, 2008). Injunctive norms can be viewed as individual perceptions of personal norms of others (Tremewan & Vostroknutov, 2021).

Culturally transmitted social norms play a key role in human social behavior (Axelrod, 1986; Bicchieri, 2006; Bicchieri & Muldoon, 2014; Fehr & Schurtenberger, 2018; Gelfand et al., 2024; Grusec & Kuczynski, 1997; Henrich & Ensminger, 2014; Horne & Mollborn, 2020; Lapinski & Rimal, 2005; Richerson et al., 2016; Wrong, 1961). These norms are learned from various sources, such as parents, education, religious practices, peers, books, and media. Across societies, the ability to learn social norms emerges early in childhood, and adherence is typically reinforced by approval or punishment for non-compliance (Chudek & Henrich, 2011; House et al., 2019). Conforming to these norms strengthens social identity (Tajfel & Turner, 1979) and is crucial for community cohesion and societal stability.

Norms vary widely across groups (Gelfand et al., 2011; Harrington & Gelfand, 2014) and impact individuals differently (Atran & Ginges, 2013; Boddy, 2014; Hofstede, 1984; Mealey, 1995). Some norms become internalized (Gavrillets & Richerson, 2017; Gintis, 2003a,b; Henrich & Ensminger, 2014). For those deeply committed to a norm, violating it can cause psychological distress, even when there are material benefits (Mu et al., 2015), and they may actively enforce these norms (Cooter, 2000).

Upholding, defending, or spreading important norms often involves significant costs (Atran & Ginges, 2013). When compliance costs are high, violations of norms may occur (Kerr et al., 2017; Lapinski et al., 2016). Social norms, shaped by historical and environmental contexts, play a role in influencing societal success (Morris, 2015; Richerson & Boyd, 2005; Turchin, 2016). While some norms remain stable, others can evolve quickly. Understanding the formation, persistence, and effects of social norms is vital for both fundamental research and effective policy-making (Gelfand et al., 2024).

METANORMS

Another important notion is that of a metanorm, which is a higher-order norm that governs the enforcement of social norms (Axelrod, 1986; Horne, 2001; Horne & Mollborn, 2020). It is essentially a norm about how to deal

with violations of primary social norms. An example of a metanorm can be seen in a community where littering is socially unacceptable (the social norm). If someone litters and another person reprimands them or reports them to authorities, the action of reprimanding or reporting is governed by a metanorm. The metanorm here supports the social norm against littering by encouraging community members to take action against norm violators.

Although specific norms may have associated metanorms, it is more common for a single metanorm to apply to a range of norms within a community or society. Metanorms usually function at a broad level, offering a general framework for addressing norm violations, rather than being tied to individual norms.

For instance, a community might have a metanorm that encourages addressing any norm violation through open dialogue and community discussion. This metanorm would apply to various social norms within that community, whether it is about maintaining cleanliness in public spaces, being punctual for meetings, or showing respect in conversations.

In some cases, specific norms might indeed have unique metanorms, especially if the norm is of particular importance or sensitivity within the community. However, these are more the exception than the rule. For example, in many school communities, there is an unwritten social norm against bullying. The corresponding metanorm here might be the collective action taken by students and teachers to intervene when bullying occurs.

Generally, metanorms are versatile and broad enough to cover a range of social norms, guiding the community's overall approach to maintaining social order and cohesion.

CULTURAL TIGHTNESS AND LOOSENESS

The degree to which groups adhere to social norms is referred to as tightness-looseness (Gelfand, 2018; Gelfand et al., 2024, 2011; Pelto, 1968; Uz, 2015). Tight cultures have strong norms and low tolerance for deviant behavior, while loose cultures have weaker norms and greater acceptance of diversity. This variation is observed between different cultural groups such as countries (Eriksson et al., 2021; Gelfand et al., 2011) or between states (Harrington & Gelfand, 2014) or provinces (Chua et al., 2019) within the same country. Variation in cultural tightness is also observed between small-scale societies (Jackson et al., 2020). Several factors drive the variation in cultural tightness-looseness, including historical and ecological factors, threat perception, cultural diversity, governance and legal systems, societal modernization, and socialization practices (Eriksson et al., 2024; Gavrillets, 2021; Gelfand et al., 2011, 2024).

SOCIAL IDENTITY

Social norms play a crucial role in social identity, defined as “that part of an individual’s self-concept that derives from their knowledge of their membership in a social group (or groups) together with the value and emotional significance attached to that membership” (Tajfel, 1981, p. 255). Social identity theory suggests that individuals align with specific identity groups, adopting behaviors and beliefs that meet the group’s perceived “standards” to derive value from the group’s status. Examples of such groups include gender, race, and political or professional affiliations, each with its own set of norms and beliefs. Adherence to these norms can lead to personal pride, while deviation might result in embarrassment or shame (Haslam, 2004; Tajfel, 1981; Tajfel & Turner, 1979, 1986). This tendency is supported by cognitive and neuroscientific evidence showing that identity-related motivations shape how people attend to, interpret, and remember information. Van Bavel et al. (2022) argue that social identities guide the updating of attention and beliefs, often leading individuals to prioritize group-aligned narratives even when they conflict with objective facts. In the colorful words of Erikson 1968, “...in the social jungle of human existence there is no feeling of being alive without a sense of identity” [p. 130].

Numerous studies demonstrate that priming (that is, activating or bringing to mind) social identity influences human decisions and preferences. For example, emphasizing ethnic or racial identity can affect time and risk preferences (Benjamin et al., 2010). Highlighting religious identity has been shown to decrease contributions to public goods among Catholics, increase them among Protestants, and increase risk aversion among agnostics/atheists (Benjamin et al., 2016). Chang et al. (2019) studied the effects of social identity on human behavior in the Dictator Game, which is an experimental paradigm used to examine fairness-related decisions. They found that political identities and framing influence norms and choices. Democrats tended to favor equal outcomes, while Republicans were hesitant to redistribute payments, even to their own detriment, under politically charged framing (Chang et al., 2019). Surveys in the UK and US revealed that individuals are conscious of the norms associated with their political identities, often choosing norm-compliance even at a personal cost, and that their expression of political identity varied with the norm’s salience and strength (Pickup et al., 2021).

Bar-On & Lamm (2023) argue that the internalization of social identity and social norms are processes that continuously interact and are difficult, if not impossible, to distinguish. When social circumstances change, individuals adapt by reassessing their social status, which can lead to changes in their attitudes toward norm adherence. They act according to the norms they

have internalized, but also adjust their behavior to align with their social and group identities. The processes of social identification dictate group belonging, while group identification influences which norms become salient. Thus, according to Bar-On & Lamm (2023), it is not merely that the processes of social identification and norm internalization influence each other; together, these intertwined processes fundamentally shape people's adherence to social norms.

INSTITUTIONAL INFLUENCE

Our actions, attitudes, and beliefs are not only influenced by peers, but also significantly shaped by institutional influence from established organizations, institutions, and authorities (Berger & Luckmann, 1966; Eagly & Chaiken, 1993; Milgram, 1974; Tyler, 2006). This influence spans across the educational, cultural, religious, moral, political, economic, and administrative domains. Authority's influence can stem from individual or collective sources, formal or informal structures, and even fictional narratives, such as mythical heroes or characters in literature and cinema. Institutions wield their influence through formal and informal mechanisms, including inculcation, communication, persuasion, and propaganda, as well as rewards and punishment. This multifaceted institutional influence profoundly shapes both individual and group behaviors and beliefs. Many institutions develop by codifying existing informal social norms into formal rules, laws, or organizational structures (North, 1990). The effectiveness of authority messages varies with both communication style and cultural tightness, reflecting cross-cultural differences in how norms are conveyed and internalized (Liu & Lapinski, 2025).

SOCIAL INFLUENCE IN MASLOW'S HIERARCHY OF NEEDS

Social influence plays a key role in fulfilling social needs as outlined in Maslow's hierarchy of needs. Individuals often conform to social norms and adjust their behavior to gain acceptance and a sense of belonging within their groups. This influence extends to esteem needs, where societal norms and perceptions of social identity dictate what is deemed valuable and respectable in a community. In addition, social influence also impacts the pursuit of self-actualization. While self-actualization focuses on realizing personal potential and creativity, societal norms and influences often steer individuals towards certain paths, shaping their understanding of their "true self."

1.3.5 *Cognitive Processes*

Human decision-making and belief dynamics involve various cognitive and psychological processes. The cognitive dissonance mentioned above, a mental discomfort caused by conflicting attitudes, beliefs, or behaviors, can lead to changes not only in behavior, but also in attitudes and beliefs (Festinger, 1957). This dissonance may arise from inconsistencies within the belief system due to logic constraints (Friedkin et al., 2016). An example would be if an individual supports both freedom of speech and the censorship of certain controversial ideas. This contradiction can cause cognitive dissonance, as it challenges the consistency of their political beliefs regarding the importance of individual liberties and the restriction of expression.

To understand others' intentions and beliefs, people often employ the "theory of mind" (Apperly, 2010; Premack & Woodruff, 1979), which refers to the ability to attribute mental states, such as beliefs, intentions, desires, emotions, and knowledge, to oneself and others, and to understand that others have beliefs, desires, and intentions that may differ from one's own. The theory of mind develops early in childhood and continues to mature throughout life (Wellman, 2014). It is also present in cognitively sophisticated animals like apes and elephants (de Waal, 2016b). A related concept is social projection, which is the tendency for individuals to assume that others share their beliefs, attitudes, values, or preferences to a greater extent than they actually do (Krueger, 2007). It involves projecting one's own thoughts, feelings, or characteristics onto others. Social projection can occur automatically and unconsciously, causing individuals to overestimate the degree of similarity between themselves and others. As a result, changes in personal attitudes can also alter expectations about others' behavior.

An evolutionary perspective suggests the development of norm-psychology, defined as "a suite of genetically evolved cognitive mechanisms that rapidly perceive the local norms of one's social group and acquire them" (Chudek et al., 2013, p. 8). This perspective posits that our inclination to adhere to norms is partly innate, while the specific norms of a society are largely cultural (Chudek & Henrich, 2011). Chudek et al. (2013) provide detailed empirical support for the concept of norm-psychology.

Emotions, which are integral to cognitive processes, play a crucial role in decision-making by guiding responses to internal and external conflicts. For example, when individuals experience cognitive dissonance after acting in a manner contrary to their moral standards or personal values, guilt often results as an emotional manifestation of this dissonance. Similarly, violations of social norms can evoke emotions such as shame, particularly when these transgressions are publicly observed or when individuals believe that their actions

could become known to others. Such emotional reactions can motivate corrective behavior or inhibit future norm violations, highlighting the interplay between emotions, cognition, and social regulation.

COGNITIVE PROCESSES IN MASLOW'S HIERARCHY OF NEEDS

Psychological factors like cognitive dissonance, the theory of mind, social projection, and logic constraints play a crucial role in understanding human motivation, especially in relation to Maslow's hierarchy of needs and its modern extensions. Cognitive dissonance in Maslow's hierarchy may arise when actions conflict with basic needs. The theory of mind impacts social needs such as belonging and esteem, as it helps individuals understand and anticipate others' behaviors in social interactions. Social projection influences how one perceives the satisfaction of social needs. Although Maslow's model suggests a logical progression from basic to higher-level needs, other psychological factors can cause deviations from this linear path.

Later chapters will introduce mathematical models designed to explore the effects of cognitive forces in individual decision-making and collective action. However, this area remains underdeveloped compared to game-theoretic approaches and social influence theory.

1.3.6 *Beliefs and Belief Dynamics*

Our beliefs, as the philosopher Frank Ramsey puts it, are “a map of neighbouring space by which we steer” (Ramsey, 1931, p. 238). The term “beliefs” plays a fundamental role in various academic disciplines, with each discipline nuancing the term to fit its specific context and purpose.

In game theory, beliefs specifically refer to the expectations or probabilities that players have regarding the actions, types, or strategies of other players in the game. These beliefs are crucial in incomplete information settings, where not all factors that influence outcomes are known to all players. Game-theoretical beliefs are typically quantifiable and are used to calculate expected utilities, make predictions about opponents' behaviors, and strategize accordingly.

In psychology, beliefs encompass a broader range of mental attitudes, representing understandings or convictions about various aspects of the world, whether or not based on empirical evidence. Psychological beliefs often influence emotions and behaviors and can encompass attitudes about yourself, others, or the environment. The importance of beliefs is embodied in the “Thomas theorem” in sociology, which states that “If men define situations as real, they are real in their consequences” (Thomas & Thomas, 1928,

p. 571–572). Essentially, our actions are often based on our perceptions of a situation, which may or may not be closely aligned with objective reality.

In sociology, beliefs are considered part of the cultural or social systems that influence and govern societal behaviors. Sociological perspectives on belief examine how they are shared collectively and how they contribute to social norms, values, and structures. Beliefs in sociology often address broader ideological systems rather than individual stances.

Mismatches between reality and beliefs can have dramatic consequences. For example, even when a majority of people want political changes, political actions can be prevented due to pluralistic ignorance (Shamir & Shamir, 2007) already mentioned above. Pluralistic ignorance can lead to preference falsification (Kuran, 1989), where individuals express preferences that differ from their true beliefs because they believe they are in the minority.

This reliance on beliefs can result in self-fulfilling prophecies (Merton, 1948; Rosenthal, 2012; Wilkins, 1976), where beliefs influence outcomes to align with expectations. A classic example is a bank run triggered by unfounded rumors of insolvency. Such prophecies can potentially cause wars if leaders mistakenly believe they are under imminent attack (Wilkins, 1976) or lead to underperformance in tasks or professions when individuals, who believe they lack the necessary skills, refrain from attempting to develop them.

Beliefs about the likelihood of collective success (often termed efficacy beliefs) play a pivotal role in motivating participation. Efficacy beliefs are based on the perceptions of individuals that their contributions, along with those of others, will lead to meaningful outcomes. These beliefs are intertwined with expectations about the behavior of others: if individuals believe that others will participate or cooperate, their own sense of efficacy, and consequently their willingness to act, is strengthened. In contrast, doubts about others' participation can undermine these beliefs and discourage engagement. The importance of efficacy beliefs is particularly evident in large-scale collective actions, where individual contributions are often small relative to the group's overall goal.

Sociological and psychological research shows that individual attitudes, personal norms, and beliefs can evolve, observable both in short-term behavioral experiments (Rokeach, 1971; Szekely et al., 2021) and on generational timescales (Albarracin & Shavitt, 2018; Bohnert & Dickel, 2011; Eriksson et al., 2024; Lersch, 2023; Rocklage & Luttrell, 2021; Strimling et al., 2025; Tormos, 2020; Vaisey & Kiley, 2021). For example, Smallenbroek et al. (2023) investigated the stability of values throughout adulthood using two long-term panel studies in Germany. The study concludes that values continue to evolve throughout adulthood, though changes occur more slowly than in earlier stages of life. Up to age 40, values such as self-transcendence

(i.e., a focus on the welfare of others and promoting the well-being of all) and conservation (i.e., preserving the status quo and protecting traditions) tend to increase, while self-enhancement values (focusing on the pursuit of personal success and dominance over others) decrease. The openness to change follows a curvilinear pattern, with distinct trends observed between highly educated individuals and those without tertiary education.

Ochoa & Vaisey (2024) provide evidence that shifts in attitudes toward sensitive topics such as the justifiability of homosexuality, abortion, euthanasia, and divorce are primarily driven by the replacement of age cohorts, as younger generations, shaped by differing social conditions, replace older ones. In contrast, changes in attitudes toward less sensitive issues tend to stem more from within-cohort transformations. Individual attitudes can undergo alterations in response to life events and transitions such as parenthood, partnership formation, (un)employment, and migration (Lersch, 2023). However, these changes become less probable with advancing age.

Using data from the 76 countries that participated in multiple waves of the World Values Survey (worldvaluessurvey.org) between 1982 and 2022, Jackson & Medvedev (2024) provide evidence of global value divergence. Their study shows that values emphasizing tolerance and self-expression have diverged most sharply, particularly between high-income Western countries and the rest of the world. Furthermore, the authors find that countries with similar GDP levels per capita have maintained similar values over the past 40 years. Interestingly, the data also show that geographic proximity has become progressively more correlated with value similarity over time. This implies that while values have diverged globally, they have converged regionally.

The theory of motivated beliefs in economics explores how individuals' desires and preferences can shape their beliefs, often leading to biased or self-serving conclusions (Bénabou & Tirole, 2016; Epley & Gilovich, 2016; Golman et al., 2016; Zimmermann, 2020). This concept suggests that people are not always objective in processing information; instead, they may be motivated to adopt beliefs that fulfill their emotional or psychological needs. In the context of economics, this might mean adjusting economic beliefs or expectations to justify past choices or to align with desired outcomes, thus reducing the psychological tension associated with cognitive dissonance.

Social norms, while often stable and durable over generations, can also undergo rapid transformations (Gelfand et al., 2024). A notable example is the shift in social norms with regard to smoking. Once a widely accepted behavior, smoking has become less socially acceptable due to health awareness campaigns and changing public attitudes.

Social identity can also change, and such shifts can rapidly alter an individual's perception of appropriate actions. For example, political realignments,

such as the “Southern Strategy” in the United States (Aistrup, 1996), saw significant changes in party affiliations and accompanying changes in political views and attitudes among large groups. Social identity can be significantly influenced by participation in ethnic organizations and fraternities/sororities (Sidanius et al., 2004), and can change with age (Tanti et al., 2011) or immigration (Adi Mana & Mana, 2009). People often adapt their behavior and beliefs in response to what they believe are changes in others’ beliefs, yet they often misunderstand the extent or nature of these changes in others (Mastroianni & Dana, 2022).

Individuals’ beliefs and attitudes can change due to previous actions they have taken, influenced by psychological mechanisms like cognitive dissonance and effort justification. The latter is the tendency to rationalize or justify actions, particularly when these actions seem to contradict one’s beliefs or values (Aronson & Mills, 1959). It often involves finding or creating explanations or excuses to alleviate the discomfort caused by cognitive dissonance.

People’s beliefs and preferences, including political ones, are profoundly influenced by propaganda (Bernays, 1928; Jowett & O’Donnell, 1992), biased media (Alesina & Fuchs-Schündeln, 2007; Peisakhin & Rozenas, 2018; Rozenas & Stukal, 2019), and education (Bowles & Gintis, 1976; Cantoni et al., 2021). An example of media influence is the changing public opinion on climate change, heavily swayed by media portrayal and coverage. Propaganda can change what people think about the beliefs of others (Huang & Cruz, 2022).

This discussion shows that beliefs are multifaceted constructs shaped by individual cognition, social context, strategic interactions, and motivational biases, all of which contribute to the complexity of behavioral outcomes in both collective and individual actions. Modeling beliefs, belief dynamics, and their coevolution with behaviors will be central to this book.

1.3.7 *Between-Individual Differences*

Predicting the impact of the various factors on the success or failure of collective action is complicated by the significant variation in individual traits (Buss, 2011). For example, genetic influences play a role in cognitive and learning abilities (Procopio et al., 2022), the ability to internalize norms (Mealey, 1995; Mu et al., 2015; Wallace et al., 2007), and the propensity to comply with authority and its symbols (Bouchard, 2009; McCourt et al., 1999). These individual differences affect not only the cognitive processes involved in decision-making but also influence observable behavioral patterns (Durkee, 2024). Culture interacts with genomics in controlling the functional organization of the nervous system and behavior (Chiao et al., 2021; Kitayama et al.,

2019). Cross-cultural studies show differences in child-rearing practices that affect norm inculcation (Barry et al., 1976; Low, 1989), as well as variations in cultural tightness or looseness of groups and societies, both of which can impact group dynamics and collective behavior (Chua et al., 2019; Gelfand et al., 2011; Harrington & Gelfand, 2014; Jackson et al., 2020). These diverse individual and cultural factors add layers of complexity to understanding and forecasting the results of collective action. Later chapters will examine how individual differences and cultural variation across groups shape collective action and other group characteristics.

1.4 Building a Theory of Collective Action

1.4.1 *Philosophical Inquiry into Collective Action*

The significance of collective actions, the obstacles they encounter, and strategies for their success have been the subject of philosophical inquiry since ancient Greece. Socrates emphasized the inherent rationality and goodness of the human soul, attributing wrongdoing to ignorance (Nails & Monoson, 2022). He believed that individuals commit errors because they lack a true understanding of what is good. This view suggests that conflicts in collective action may stem from differing interpretations of what is “good.” Plato envisioned a just society where educated individuals would act for the collective benefit, understanding and valuing their community roles (Kraut, 2022). However, he acknowledged obstacles to this ideal, including human selfishness and resistance to changing established habits and norms. In contrast, Aristotle recognized the diversity of individual interests and stressed the need to balance them with the community’s welfare (Shields, 2022). He advocated for a constitutional government that would ideally represent the middle class, believing it to be most inclined toward the common good. Aristotle was also aware of the complexities in collective action, famously noting that “What is common to the greatest number gets the least amount of care” (Aristotle, *Politics*, Book 2, Part 3), an early recognition of what later became known as the collective action problem.

Later philosophers such as Hobbes and Adam Smith emphasized the necessity of a strong state or coercive power to facilitate collective action, particularly to overcome individuals’ tendency to free-ride on the contributions of others (Seabright et al., 2021). In contrast, Rousseau posited that collective action can be effective when it resonates with the inherent goodness and empathy of humans and is directed towards the common good (Seabright et al., 2021). However, he also cautioned that societal corruption and inequalities could hinder sincere collective efforts and provoke conflicts. Darwin’s (1871) tribal group selection hypothesis provided an

evolutionary explanation for how humans could achieve cooperation in large groups despite conflicting individual interests. For Marx and Engels, collective action was crucial in transforming society from capitalism to communism (Marx & Engels, 2015). They viewed it as a pivotal force for societal change, empowering the proletariat to develop class consciousness, unify, and confront prevailing capitalist systems. However, they acknowledged significant challenges to collective action, including ideological manipulation, internal divisions, and external resistance. Notably, as Mancur Olson (Olson, 1965) pointed out, while Marx and Engels consistently criticized the selfishness of the bourgeoisie, they did not fully consider how workers' self-interests might lead to free-riding, during the revolution or after establishing a communist state. In the communist states that appeared in the last century, propaganda emerged as a key instrument in rallying diverse groups and the broader populace toward various collective actions, complementing coercive measures.

1.4.2 *Classical Game Theory*

In the second half of the last century, non-cooperative game theory models increasingly focused on collective action (Holahan & Lubell, 2016). A pivotal contribution was Mancur Olson's "The Logic of Collective Action" (1965), which identified free-riding as a major obstacle in collective efforts and emphasized selective incentives and institutional roles in promoting cooperation. Following Olson, economic theories focused mainly on institutions and government structures that overcome obstacles to collective action (Holahan & Lubell, 2016; Ostrom, 1990, 2014).

Olson's work was grounded in classical game theory, which assumes that individuals possess comprehensive knowledge about their circumstances. These models presuppose that people are driven to maximize their rewards, derived primarily from consumption and leisure, subject to constraints such as time and wealth (Akerlof & Kranton, 2005; Molnar & Loewenstein, 2022; von Neumann & Morgenstern, 1947). They are also able to identify and execute actions that maximize their material benefits. This approach implies a high level of rationality and efficiency in decision-making in pursuit of economic self-interest. In addition, it often assumes that people have access to all the relevant information needed to make optimal decisions in their economic endeavors. Classical game theory models were mainly focused on equilibrium behavior. von Neumann & Morgenstern (1947) emphasized this point: "We repeat most emphatically that our theory is thoroughly static. A dynamic theory would unquestionably be more complete and preferable" [p. 44–45].

Subsequent game theory extensions consider decision-making errors (Goeree et al., 2016b), altruism and other-regarding preferences (Andreoni,

1990), fairness (Bolton & Ockenfels, 2000; Fehr & Schmidt, 1999), and emotions (Geanakoplos et al., 1989), with some applications in collective action. The theory of repeated games accounts for scenarios in which the same players engage in interactions over multiple rounds or periods (Fudenberg & Tirole, 1992). These approaches recognize that players may have diverse preferences and objectives that can influence their decision-making in each period. In particular, these models typically assume that individual preferences remain unchanged as the game progresses, regardless of the outcomes or experiences during the game.

1.4.3 *Evolutionary Game Theory*

Evolutionary game theory expanded the mathematical theory of collective action by incorporating bounded rationality, population thinking, and temporal dynamics into game-theoretic models (Hofbauer & Sigmund, 1998; Newton, 2018; Sandholm, 2010; Schuster & Sigmund, 1983; Taylor & Jonker, 1978). This approach identified additional mechanisms facilitating cooperation and collective action, including reciprocity, reputation, group selection, and partner choice (discussed in Chapter 2). It has also corroborated the results of population genetics on the effects of kin selection (Frank, 1998; Hamilton, 1964; Rousset, 2004). In these mechanisms, a key factor that leads to more effective collective action is the grouping of individuals with cooperative tendencies (Fletcher & Doebeli, 2009). Typically, evolutionary game theory models assume that individual behavior is either genetically inherited or acquired through imitation of role models. In these models, the evolutionary fate of a strategy in a population depends on its current frequency and its relative success compared to other strategies in the same population. This framework facilitates the study of behavioral strategy evolution not only in humans but also in non-human species, extending to even simple organisms like bacteria.

1.4.4 *Behavioral Economics*

Both classical and evolutionary game theory models focused almost entirely on expected material or reproductive costs and benefits to explain behavioral choices. The situation started to change with the emergence and advances in experimental studies of behavior (Fehr & Schmidt, 1999; Kahneman, 2011; Thaler, 2015) and the expansion of empirical field studies (Banerjee & Duflo, 2017), which have revealed significant deviations from the behaviors predicted by game-theoretic models. These findings show that individuals often act counter to rational self-interest, making errors or acting prosocially

without immediate material gain, even in communities lacking formal institutions. Experimental studies show that a significant proportion of people are conditional cooperators which means they are willing to cooperate and behave altruistically, but only if others do the same (Fehr & Schurtenberger, 2018; Fischbacher et al., 2001; Gächter, 2014; Thöni & Volk, 2018). People are also willing to altruistically punish free-riders (Chaudhuri, 2011; Fehr & Gächter, 2002; Gächter, 2014). This work, as well as research in social psychology and sociology, has also shown significant effects of personal norms, social influence, cognitive processes, changing beliefs, and between-individual differences on decision-making. Empirical research also recognizes “irrational” behaviors due to cognitive biases, limited information and emotions, and highlights the effects of psychological factors, heuristics, and biases in decision-making. Some economists have argued for the need to incorporate personal norms (Gintis, 2003a,b, 2005; Henrich & Ensminger, 2014) and social norms (Bicchieri, 2006; Bicchieri & Muldoon, 2014; Fehr & Schurtenberger, 2018; Ostrom, 1998, 2000) into models of cooperation and collective action.

1.4.5 Gaps in Collective Action Theory

The inclusion of psychological factors and social influence in mathematical models of collective action poses an additional challenge because personal and social norms can change as social interactions unfold, causing individual preferences to shift due to social influence from peers and external authorities. The dynamics of individual preferences and opinions can be described using the models and tools of social influence theory (Axelrod, 1997; Castellano et al., 2009; DeGroot, 1974; Flache et al., 2017; Rashevsky, 1949). These models examine how individuals change their preferences and opinions through interactions, one-on-one or in groups. They are inherently dynamic and account for variations in individuals’ social environments, such as their roles within social networks. However, this theory has only been minimally integrated with game-theoretic approaches to decision-making. In addition, key psychological factors such as cognitive dissonance, social projection, and theory of mind remain largely unaddressed in current models of behavior and belief change.

Another limitation of existing theoretical work is that it often has a narrow scope when addressing differences between individuals. In standard game-theoretic models of collective action, these differences typically manifest only in the actions/strategies employed. Similarly, in social influence models, between-individual differences are usually confined to the opinions or beliefs held and the individuals’ positions within a social network. However, humans

exhibit a wide range of differences in morphology, psychology, cognition, culture, and personal experiences. These diverse characteristics significantly impact both decision-making processes and the dynamics of belief formation.

1.5 A Need for a Unified Model of Collective Action

Our society faces numerous challenges, including climate change, pandemics, inequality, economic crises, political polarization, misinformation, violent conflicts, and refugee crises. Solving these requires consensus-based policies, adequate funding, technological capabilities, and a deep understanding of human behavior and beliefs. The challenge with the latter lies in the multitude of factors shaping individual preferences and decision-making, along with the intricate mutual influences within social networks, which make human groups very complex coevolving systems. This complexity is illustrated by a highly cited review published in 2015, which listed 82 different theories of behavior and behavioral change (Davis et al., 2015) (see also a review by Eyster et al. (2022) which lists 86 different theories).

The analysis in the preceding sections highlights the challenges of developing a general and predictive quantitative theory of human decision-making in collective action. Such a theory must encompass a multifaceted approach that takes into account six critical types of factors:

1. **Material factors:** These include tangible elements such as financial incentives, available resources, and environmental constraints, all of which directly impact human well-being and significantly shape decision-making and behavior in collective action contexts.
2. **Personal beliefs, norms, attitudes, and biases:** The theory should consider the influence of an individual's internalized values, moral standards, personal attitudes, and preferences. These deeply ingrained elements significantly shape how decisions are perceived and made.
3. **Social influence:** This involves the impact of peers and various authorities, such as educational, cultural, religious, and political leaders. The theory should recognize how these influences can sway or modify individual beliefs and decision-making in the context of collective action.
4. **Cognitive factors:** This aspect covers the role of mental processes, including perception, memory, reasoning, and problem-solving abilities, in decision-making. It acknowledges that cognitive capabilities and limitations play a crucial role in the formulation and execution of decisions.
5. **Dynamic nature of preferences and beliefs:** The theory should account for the fluid nature of personal preferences and beliefs about others,

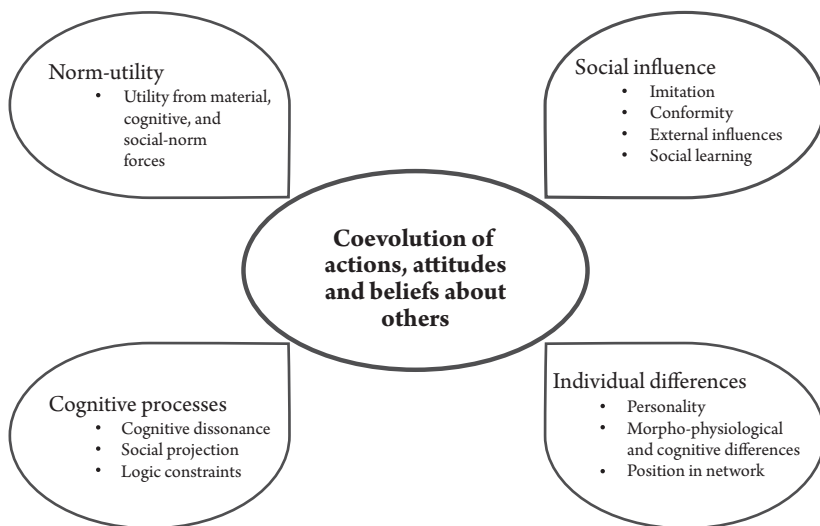


FIGURE 1.1. An integrative approach to modeling social behavior.

recognizing that they can evolve and change during social interactions. This dynamic aspect acknowledges that decision-making is not static, but is influenced by ongoing social exchanges and experiences.

6. **Between-individual differences:** A comprehensive theory must consider the diversity in physical, psychological, and cultural traits among individuals. These differences lead to different responses and approaches to similar situations, affecting the outcomes of collective decision-making.

For a theory of human decision-making in collective action to be both comprehensive and predictive, it must seamlessly integrate diverse factors, recognizing the intricate interaction between material conditions, personal and social influences, cognitive processes, individual differences, and the dynamic nature of human interactions (see Figure 1.1). Although numerous attempts in this direction have emerged in recent decades, they are often scattered throughout various scientific fields, including economics, social psychology, sociology, political science, and biological and cultural evolution.

1.6 Book Structure

The primary aim of this book is to systematically integrate recent theoretical insights and research findings related to the six critical types of factors outlined above into a simple, comprehensive theoretical framework for understanding collective action. To achieve this goal, the book explicitly focuses

on theoretical and modeling perspectives, drawing from classical and evolutionary game theory, psychology, and sociology, to address the fundamental question: **“What factors support the success of collective action?”**

Among the various factors examined, *social influence* will emerge as a powerful yet previously under-explored element in theoretical and modeling research, significantly shaping collective behavior and determining the outcomes of collective actions.

The book’s content unfolds as follows. In Chapter 2, I begin by reviewing conventional game-theoretic models of collective action. Then, in Chapter 3, I consider theoretical work aiming to understand the evolution of social influence within our species. Chapter 4 focuses on existing theories that elucidate the dynamics of opinions and beliefs shaped by social influence.

Then I start to interconnect various components. Chapter 5 explores the effects of social influence on decision-making when personal norms are stable, while Chapter 6 extends this examination to the case of evolving personal norms. Chapter 7 is a pivotal point, where I synthesize various factors and present a theoretical approach to modeling the coevolution of actions, personal norms, and beliefs about others. In Chapter 8, I discuss different behavioral experiments that validate and parameterize the theory described in Chapter 7. Chapter 9 considers some applications and adaptations of this framework to human behavior online. Finally, Chapter 10 provides a comprehensive summary and draws overarching conclusions based on the insights gained throughout the book.

Although this book engages with mathematical models, which may seem daunting to some readers, it is essential to emphasize that the level of mathematical proficiency required to grasp the content is quite accessible. A basic understanding of calculus, linear algebra, linear stability analysis, and simple game-theoretic models suffices. Furthermore, I will complement the material with numerous illustrative figures and offer intuitive explanations to enhance comprehension, even of complex results. For those seeking an introductory approach, Paul Smaldino’s book (Smaldino, 2023) is a highly recommended resource.

As the saying goes, a picture is worth a thousand words. However, in the realm of exact sciences, an equation has the value of a thousand pictures. Equations have significant value, often representing concrete outcomes that theoreticians produce. Thus, equations and their interpretations are the primary focus of this book. They serve as a practical toolkit, allowing social scientists to validate or refine their intuitions about human behavior and belief dynamics by substituting specific numerical values into equations and interpreting the results.

The equations discussed fall into three main types: those specifying the model and its underlying assumptions, those describing changes in key variables characterizing individual actions and beliefs between two time moments, and those predicting the behavior of the system over time, typically a long-term equilibrium behavior. Interpreting these equations and comparing their predictions with empirical data validates or falsifies the model.

Recently, advanced AI has introduced an alternative approach to social science modeling: simulating populations of agents powered by Large Language Models (LLMs), which largely bypasses the need for equations. Although LLM-based simulations excel at capturing complexity and emergent phenomena, their opacity and lack of theoretical grounding often limit their ability to provide clear and actionable insights. In contrast, I will rely on traditional mathematical modeling, which, with its explicit assumptions, facilitates understanding and critique. This approach offers the theoretical clarity, transparency, and precision necessary to uncover and analyze the mechanisms driving human behavior and belief dynamics.

Throughout the book, I will avoid or only briefly outline intermediate mathematical derivations, focusing on the “final product” instead. Although this approach may frustrate more mathematically oriented readers, it is done to streamline the presentation. In most cases, the derivations are straightforward, albeit tedious.

At the end of each chapter, I provide its nontechnical summary and a list of key findings.

Key findings

- Collective action solves provision, protection, and coordination problems; free riding is a central obstacle.
- Six forces matter in real decisions: material payoffs, personal norms, social influence, cognition, evolving beliefs, and individual differences.
- Social influence is a major, underused lever in theory.
- Chapters 2–4 build tools; Chapters 5–7 integrate them; Chapters 8–9 test and apply; Chapter 10 synthesizes.
- If you skip math, read each chapter’s introduction and summary first; refer to figures as needed.

(continued...)

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