# COGNITIVE AND EVOLUTIONARY FACTORS IN THE EMERGENCE OF HUMAN ALTRUISM

*by James A. Van Slyke*

*Abstract.* One of the central tenets of Christian theology is the denial of self for the benefit of another. However, many views on the evolution of altruism presume that natural selection inevitably leads to a self-seeking human nature and that altruism is merely a façade to cover underlying selfish motives. I argue that human altruism is an emergent characteristic that cannot be reduced to any one particular evolutionary explanation. The evolutionary processes at work in the formation of human nature are not necessarily in conflict with the possibility of altruism; rather, aspects of human nature are uniquely directed toward the care and concern of others. The relationship between altruism, human nature, and evolution can be reimagined by adopting an emergent view of the hierarchy of science and a theological worldview that emphasizes self-renunciation. The investigation of altruism necessitates an approach that analyzes several aspects of altruistic behavior at different levels in the hierarchy of sciences. This research includes the study of evolutionary adaptations, neurological systems, cognitive functions, behavioral traits, and cultural influences. No one level is able to offer a full explanation, but each piece adds a unique dimension to a much larger puzzle.

*Keywords:* altruism; cognition; compassion; emergence; empathy; evolution; human nature; reduction; theological anthropology

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One of the central tenets of the Christian tradition is the denial of self for the benefit of another, which is a general definition of altruism. This is one of the defining characteristics of many religions and often is presented as an important feature that exemplifies religious values. However, many current and historical views on evolution presume that natural selection inevitably leads to a self-seeking human nature, and altruism is merely a façade to cover underlying selfish motives. How can the altruism present in so many religious traditions arise from "selfish genes" and "nature red in

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[*Zygon*, vol. 45, no. 4 (December 2010)]
 ISSN 0591-2385

tooth and claw" (Dawkins 1976; Tennyson 1850)? Human altruism is an emergent feature of human nature that cannot be reduced to any one particular evolutionary explanation. The evolutionary processes at work in the formation of human nature are not necessarily in direct conflict with a theological interpretation of altruism; rather, aspects of human nature are uniquely directed toward the care and concern of others. Evolutionary and cognitive factors that contributed to the emergence of human altruism can be incorporated into a theological worldview that includes a relational definition of sin, an ultimate purpose for the compassionate love of human altruists, and a kenotic view of God's love.

The selfish-gene theory of human evolution is problematic in terms of its description of human nature as simply a product of selfish genes and a vehicle for the promotion of genetic interests. However, the relationship between altruism, human nature, and evolution can be reimagined by adopting an emergent view of the hierarchy of science and a theological worldview that emphasizes self-renunciation. Different evolutionary processes such as kin selection, reciprocal altruism, indirect reciprocity, and group selection enabled the emergence of human altruism by slowly increasing the circle of concern toward direct relatives and ultimately toward others.

These adaptations that enabled social relationships became co-opted into more complex cognitive functions that currently are studied in the fields of social/affective neuroscience and neuroeconomics. The evolution of the social brain included cognitive/emotional functions such as imitation and theory of mind, which contributed to the ability of humans to show empathy to one another. Therefore, the investigation of altruism necessitates an approach that analyzes several aspects of altruistic behavior at different levels in the hierarchy of sciences. This research includes the study of evolutionary adaptations, neurological systems, cognitive functions, behavioral traits, and cultural influences. No one level is able to offer a full explanation, but each piece adds a unique dimension to a larger puzzle.

## Selfish Genes and Reductionism

Richard Dawkins in *The Selfish Gene* (1976) initiated a highly influential description of the role of genetics in the process of natural selection by suggesting that genes are selfish in that their primary function is to survive and reproduce in subsequent populations. Dawkins was attempting to popularize a primary factor at work in evolution, yet genes are not in any way selfish, as the word would commonly be defined in terms of human nature. Selfishness was simply a helpful analogy to describe the genetic processes that enabled the survival and multiplication of different organisms on the earth. A substantial amount of literature in philosophy and theology criticizes this view especially in regard to human altruism (Boyd 2007; Midgley 1983; Rolston 1999). The science behind the selfish-gene

theory is not necessarily incompatible with the possibility for human altruism. The problem with it is the reductionism that is often associated with the theory and the assumption that selfish genes inevitably lead to a selfish human nature.

Science works under the assumption of a hierarchy of multiple levels of empirical investigation. Lower levels in the hierarchy study smaller particles (physics, chemistry, cellular biology), while higher levels study larger systems (psychology, sociology, ecology). Based on this hierarchical view of science, Francisco Ayala (1974) identified three different forms of reductionism: methodological, epistemological, and ontological. Methodological reduction is entirely unproblematic in that it is simply the method by which scientists study a whole by focusing on the parts. Epistemological reduction deals with potential reductions and perhaps outright eliminations of theories at one level of science by theories at another level. However, Robert McCauley (2007) has demonstrated that this type of reduction occurs rarely and that most forms of scientific investigation at one level require conceptual definitions supplied by other levels. Causal reduction, which is a form of ontological reduction, is the proposition that the best explanation for any particular phenomenon can be found one rung below the current level of analysis within the hierarchy. Causal processes are "bottom-up," from part to whole. "Causal reductionism is the thesis that, in the hierarchy of the sciences, all causal influences are 'bottom-up'—from part to whole. This thesis has been so pervasive for so long that it should be counted as one of the central metaphysical assumptions of the modern era" (Murphy 2007, 19). In selfish-gene theory, causation is primarily bottom-up, from genes to organisms, and organisms are merely vehicles used by genes to serve their own genetic self-interest. Thus, the human being is viewed as simply a vehicle for the primary work of the genes or simply a machine that functions according to genetic interests (Dawkins 1976; Schloss 2004).

However, genetic self-interest is only one factor involved in the formation of human nature. It is not a complete description because of the interplay of emergent and systemic factors in the formation of human nature.

Adopting an emergent view of the relationship between systemic wholes and component parts can alleviate problems in the selfish-gene view when it is interpreted as a causally reductive process. Emergence is essentially the antithesis of reduction; whole systems are simply not reducible to their parts because certain functions are a consequence of systemic interactions and not just the summation of the individual actions of parts (Van Gulick 2001; Murphy 2007). Additionally, causation is not just bottom-up but also top-down in that certain systemic constraints are able to constrict the causal role of the component parts (Deacon 2007; Murphy and Brown 2007; Juarrero 1999). From an emergent point of view, evolutionary processes cannot be reduced to functional properties of genetics; there is a

reciprocal relationship between genes, organisms, and the environments in which selection takes place with no one essential feature fulfilling the primary causal role.

As a classic example, Donald Campbell (1974) points out the processes involved in the evolution of the jaw structure of a worker termite. Several processes, such as genetic and cellular, work in a bottom-up fashion in the construction of the jaws. There is also a form of top-down causation in that features of the environment constrain what types of adaptations will succeed or fail based on the survival or extinction of different species. Thus, at the genetic level, genes encode for the particular proteins that will eventually construct the jaw, but the environment in which that particular trait is expressed ultimately determines the fitness of the termite according to whether that trait facilitates survival or reproduction.

In fact, changes in the environment can affect the expression of different genetic variables. Although most mammals use lactose early in life to break down enzymes in milk, this ability eventually disappears after weaning. This changed in humans with the initiation of animal husbandry (Feldman and Laland 1996). This environmental change imposed a selection pressure that acts as a top-down constraint in the evolutionary process, which favored those with higher levels of tolerance to lactose over the life span because milk became a regular part of their diet.

If causation is both bottom-up and top-down, and whole systems contain unique properties that are not reducible to their parts, it is necessary to investigate any phenomenon at several levels in the hierarchy of science. Thus, a multilevel approach is best when investigating human altruism and the corresponding scientific research in evolutionary and psychological science. No one level in the hierarchy can provide a full explanation of any given phenomenon; each level runs into boundary questions that can be answered only at an adjacent level (Barbour 1997). The explanation for altruism therefore cannot be one-directional from genes to higher levels in the hierarchy, and even if genes may be considered selfish, that does not necessarily imply that human nature is also selfish. The emergence of human nature requires several complex variables coupled with top-down and bottom-up processes that cannot be simply reduced to selfish genes or any other type of evolutionary adaptation. However, as I shall demonstrate, several evolutionary and cognitive processes contributed to the emergence of human altruism, and an accurate understanding of this capacity requires many different lines of research. Human nature has slowly evolved to include instincts and behaviors that foster social relationships. This evolution has included the expansion of our primary circle of concern from self to relatives and ultimately to others.

## Social Bonds, Neuroeconomics, and Evolution

Social bonds, attachment, and cooperation are partially consequences of evolutionary processes such as kin selection, reciprocal altruism, indirect reciprocity, and group selection. As maintenance of social relationships became a selection pressure on human minds, different systems that were able to deal with these pressures evolved (Dunbar 1998). The possibility of human altruism emerged as these evolutionary processes fashioned human nature toward a wider circle of concern from simple self-interest to care for kin and ultimately care for the other. Several areas of research in primatology demonstrate the natural sociality and maternal care of our closest primate cousins. Neuroeconomics and social affective neuroscience are illuminating the basic mechanisms of social decision-making and the unique role of empathy in fostering relationships.

The ethologist Konrad Lorenz (1935) originally suggested a bond in geese parents and their offspring that eventually became the basis of attachment theory. Lorenz hypothesized that baby geese will imprint the mother and follow her wherever she goes. This is an instinctual trait that follows a simple rule: Follow the first thing that moves—which Lorenz was later able to use to get baby geese to follow him. In a series of famous experiments from 1957 to 1969, Harry Harlow demonstrated several examples of attachment behavior in rhesus monkeys (Harlow 1958; 1969; Harlow and Harlow 1965; Harlow, Harlow, and Hansen 1963). When given the choice between a cloth mother and a wire mother, rhesus monkeys consistently chose the cloth mother as a source of comfort for anxiety over the wire mother even when the wire mother had milk. When faced with a threatening situation, the rhesus monkeys would use the cloth mother as a source of comfort and stability.

In rhesus monkeys, the attachment bond initially is maintained by the mother through maintaining close contact with and proximity to her infant (Hinde and White 1974; Suomi 1999). The young rhesus monkey uses this attachment relationship as a secure bond through which to explore the world and develop other social bonds. Maternal and social bonding is built upon several neurological systems and the corresponding neurochemical components such as oxytocin, prolactin, and endorphins (Panksepp 1998). For example, infant suckling on the nipples of the mother sends messages to the paraventricular nucleus of the hypothalamus, which releases oxytocin into circulation to facilitate breast-feeding (Landgraf et al. 1992; Panksepp 1998).

Based on evidence from ethology and his own background in psychodynamic psychology, John Bowlby (1958; 1969) argued that attachment is an essential feature of human development. This relational bond is established through instinctual responses of proximity-seeking behaviors in the infant and corresponding nurturance and protection instincts from the

mother, which forms a feedback loop of reciprocal interactions that foster the development of the bond. Attachment behavior is accomplished through several neural subsystems that are important for psychological as well as physiological health.

In the human brain, the cingulate gyrus, which lies just above the corpus callosum in the interior of the longitudinal fissure, plays an important role in mothering instincts including nursing and attachment (Cozolino 2006). Damage to this area has detrimental effects on maternal behaviors, empathetic responses, and emotional stability (Brothers 1996). Attachment behavior contributes to the proper regulation of catecholamines, dopamine, and noradrenaline, which are important neurochemicals in the central nervous system (Schore 2001). These basic regulatory systems of human physiology play an important role not only in general health but also in mental health. Impairments in the regulatory systems of the right hemisphere of the brain can contribute to several mental disorders such as post-traumatic stress disorder (Schore 2002).

Attachment is a consequence of the evolutionary process of kin selection; an organism will help another organism based on the degree of genetic relatedness between them (Hamilton 1964; West-Eberhard 1975; Cartwright 2008). Several studies in evolutionary psychology have shown that helping behavior often is directed toward one's relatives in contrast to other persons. During one experiment subjects were given monetary rewards that were distributed to themselves, their close relatives, or a children's charity according to the amount of time they could remain in an uncomfortable position (Dunbar 1996). Overwhelmingly, subjects would endure the most discomfort for themselves and their closest relatives. In another experiment, grandparents were shown to be discriminating in the amount of monetary investment given to grandchildren. Inheritance was usually distributed based on the degree of genetic relatedness (Euler and Weitzel 1996; Smith, Kish, and Crawford 1987).

In human culture, there is substantial motivation to care for our relatives even at a cost to ourselves. This is not necessarily altruism, but it is a step from self-interest to a larger concern for the needs of another. Attachment, and the corresponding social bonds it facilitates, is an important step in the emergence of human altruism. Our circle of social and emotional concern expanded from ourselves to other immediate relatives. Even if parental instincts are not exactly the same as care for an unrelated individual, there is still something morally exemplary about parents who care for their children well. In addition to attachment, different forms of social relationships and cooperation in groups also played an essential role in the emergence of altruism, as demonstrated by research in primatology.

Our nearest primate relatives, the common chimpanzee and the bonobo, inhabit a highly complex and strikingly familiar social context. In these primate social groups there is an equal measure of conflict and cooperation

in the maintenance of social bonds, competition for mates, and survival. The common chimpanzee has a hierarchical system with an alpha male that enjoys sexual privileges and rights to food. Hierarchical systems are not simply about dominance, however; they also serve a role in the social cohesion of the primate group. "Power is not an individual attribute, it is a relational one. For every powerful person there are others supporting that superiority, feeding that ego," writes Frans de Waal (1996, 98). De Waal recounts the story of the rise of a chimpanzee named Nikkie to the alpha role in a social group (de Waal 2005). His status could not be fully attributed to his own initiative because he relied on an older male (Yeroen) to help fend off a potential rival (Luit). In addition, a female named Mama may have wielded even more power than Yeroen because of her ability to ease tensions and her role as the primary matriarch of the group. Among bonobos, a female matriarch is the head of the group, maintaining power through relationships with other females (de Waal 2005). Social relationships among nonhuman primates seem to approximate human behaviors in terms of cooperation and even politics.

Social decision making has become one of the major areas of research in neuroeconomics. Subjects play economic games using real money, and researchers investigate the neural mechanisms used during the games (Fehr and Camerer 2007). Historically, the dominant theory is that persons will make their decisions in economic games based on rational principles and their own self-interest (Camerer and Fehr 2006). However, several studies are calling this into question. Players often make decisions based on emotional preferences and the social consequences of the strategies used by other players in the game. For example, in the prisoner's-dilemma game, participants prefer mutually cooperative strategies to unilateral defection, even though defection results in higher monetary payoffs (Fehr and Camerer 2007). This preference may be linked to the reward systems of the ventral striatum that have been associated with the experience of mutual cooperation between human partners (Rilling et al. 2002; 2004). Participants also tend to punish players who are acting unfairly in the game even if the punishment takes away from their overall monetary gain. One study associated this type of punishment with the dorsal striatum, which was strongly activated during a real punishment condition in contrast to a symbolic one (de Quervain et al. 2004).

This research suggests that economic games involve several neural processes involved in social and emotional cognition. In one study, participants played economic games with confederate fair and unfair players. When the confederates were administered a brief electrical shock, the confederate fair players elicited an empathetic response in the participants, which was measured by activation in the anterior cingulate and anterior insula. The confederate unfair players elicited a desire for revenge in the participants, which was measured by activation in the nucleus accumbens and orbital

frontal cortex (Singer et al. 2006). Research by Paul Zak and colleagues has shown that the neuromodulator oxytocin (also associated with maternal behaviors) can increase generosity in humans through its effects on reward, emotion, and social areas of the brain (Zak, Stanton, and Ahmadi 2007). In the ultimatum game, generosity was increased by 80 percent over placebo in participants who were infused intranasally with oxytocin, and the participants who were generous left the game with less money. Thus, neuroeconomics studies not only the behaviors of persons in regard to economics but also the relative contributions of social and emotional cognition to the emergence of empathy, compassion, and altruism.

Reciprocal altruism and indirect reciprocity are two theories that have been used to describe the evolution of social cooperation. Reciprocal altruism claims that acts which benefit another will be offered as long as there is a reasonable expectation that the benefit will be returned at a later time (Trivers 1971). In general, three conditions must hold for reciprocal altruism to occur: reasonable chance of meeting the recipient of altruism again, must be able to recognize cheats and those who honestly engage in reciprocation, and the ratio for "cost to donor/benefit to receiver must be low" or at least a higher degree of certainty for reciprocation (Cartwright 2008, 200). Examples of this type of reciprocal altruism have been demonstrated in vampire bats and baboons (Wilkinson 1990; Dunbar 1980).

Another factor involved in the evolution of social cooperation is indirect reciprocity, which is the role of reputation in receiving cooperation and help from others (Alexander 1987). Even if a person does not get direct benefits from helping another, forming a reputation as an honest helper can help in the long run for receiving benefits from others. Using computational programs that model these types of indirect reciprocal relationships, it was found that cooperation could spread in a population of players if there was an ability to observe and keep track of those who helped and those who did not even if the giver and receiver of help never met up again directly (Nowak and Sigmund 1998).

Group or multilevel selection theory argues that genes for altruistic behavior may be selected if the between-group enhancement is greater than the within-group reduction of fitness to the altruist (Sober and Wilson 1998). However, this also can have a dark side in that this often increases between-group hostility, which can lead to violence.

## Conceptions of Human Nature and Sin

In the first section, I described the problem of causal reductionism as it relates to the selfish-gene theory. The second problem that exists in the selfish-gene analogy is the way in which the term *selfish* has become a description of the primary inclination of human nature. It is not just genes that are selfish replicators, but the core of human nature is egotistic, if not savage and morally bankrupt. According to de Waal, a popular view among

many biologists is that human nature is selfish at its core and covered by a veneer of morality and culture. "Human morality is presented as a thin crust underneath of which boil antisocial, amoral, and egoistic passions" (de Waal 2006, 10). This point of view is epitomized in a statement by Michael Ghiselin, "Scratch an 'altruist,' and watch a 'hypocrite' bleed" (1974, 247). As a consequence, any positive account of human goodness and altruism is merely self-deceptive; morally virtuous acts are simply a strategy to serve the selfish interests of individual persons and ultimately their genes (Wright 1994).

However, as I have shown, several aspects of the evolution of human nature include an increasing circle of concern that goes beyond simple self-interest. To the extent to which human nature is defined according to particular dispositions and behaviors, the social pressures on the evolution of the human mind have produced a capacity for attachment and cooperation with others that has become a major aspect of human nature. This is not to deny the existence of self-interest or even selfishness in human nature but rather that selfish genes produced a core human nature that is ultimately selfish. Selfishness and concern for others exist on a continuum in human nature (and other animal natures as well).

Selfishness as the core of human nature has been a live option throughout Western history. This is exemplified in the work of Thomas Hobbes. In *The Leviathan* ([1651] 2008) he describes the "war of all against all," which clearly was an important influence on philosophical ethics during modernity and continues in current discussions. Hobbes argued that the basic attribute of human nature is egoism, which inevitably leads to a savage and brutal competition for resources in the absence of constraints imposed by a ruling monarch. William Golding illustrates this view in the novel *Lord of the Flies* (1954): When a group of young adolescent boys are stranded on an island without parental authority, religion, or other forms of social constraint, the situation slowly regresses into rivalry, irrational fears, and the ultimate violent murder of several of the young boys.

Theologically, this type of view is demonstrated in definitions of sin that emphasize the essential corruptibility or depravity of human nature. Augustine's notion of "original sin" demonstrates this point of view in that the first sin of Adam led to the ultimate corruption of human nature. "Hence from the misuse of free will there started a chain of disasters: mankind is led from that original perversion, a kind of corruption at the root, right up to the disaster of the second death, which has no end" ([1467] 1984, 523). The doctrine of original sin greatly impacted John Calvin and his own formulation of the doctrine of total depravity: "Therefore original sin is seen to be an hereditary depravity and corruption of our nature, diffused into all parts of the soul" ([1559] 1999, 236).

The theory of evolution is not introducing a novel view of the selfishness of human nature but has become the latest battleground for constructing

an account of human nature based on the origins of the human species within evolutionary history. However, there are other options to this picture of human nature. Several evolutionary processes contributed to the emergence of human nature, not all of which were purely selfish. Self-interest, as opposed to selfishness, clearly has played an important role in evolution at the levels of both genetics and the survival of the individual organism. Yet, especially in mammals, survival of the individual organism has relied on several adaptive traits, such as attachment and cooperation, that are essentially concerned with social relationships. These traits contributed to the emergence of the basic tendencies of human nature and allowed for the emergence of altruism, truly sacrificing self-interest in the service of another. Thus, human nature is not inherently evil or selfish. Natural selection has brought about certain emotional and cognitive systems that promote care for others.

As a consequence, sin can be defined as those aspects of human nature that lead to a rupture within relationships or, using the language of my argument here, behaviors and dispositions that decrease the circle of concern rather than increase or enhance it. Thus, sin can be described in relational terms rather than as an individual or internal definition of human nature as depraved, corrupt, or infected. Several scholars have shown that the Old Testament defines sin primarily in terms of broken relationships or covenants (Heschel 1962; Westermann 1984; Von Rad 1972). The parable of the prodigal son demonstrates the restoration of relationship that was such an important element of Christ's description of the coming kingdom of God (Luke 15:11–32 NRSV). Many contemporary theologians define the purpose of life as an expression of the Great Commandment to love God and to love one's neighbor (Connolly 2002). Thus, sin can be identified as any type of economic, social, moral, environmental, or other factor that causes a deficiency in our ability to love God and love others.

Keith Ward (1998) defines sin in a soteriological context, which characterizes sin as an incapacity, inability, or bondage that needs to be transformed into a life of loving response to a creative God. This is in contrast to a forensic account that emphasizes guilt, punishment, and blame resulting from the inheritance of original sin.

From an evolutionary perspective, sin cannot be an inherited characteristic of moral blame that is present in infancy because of transmission through the seminal fluid, as Augustine originally formulated the doctrine of original sin ([1961] 1996). However, the severity of evil and human selfishness cannot be discounted, either. The gravity of sin is an important aspect of the concept of original sin that should be retained without the sense of original guilt (McClendon 1994).

Human nature instantiates two possible states of relationships between persons, one that is wholly focused on self-gratification and one that incorporates a concern for the other. In the next section, I discuss the cogni-

tive factors involved in the expression of empathy, which is the basis of compassionate love expressed in human altruism.

## Imitation, Theory of Mind, and Empathy

The evolution of human nature and the possibility of human altruism included an increasing concern for the other. Empathy, an important component of altruism, emerges out of several emotional and cognitive processes that involve imitation and theory of mind.

Imitation, an instinctual aspect of human nature that we may share with other primates, plays an important role in the formation of theory of mind. Theory of mind emerges based on imitation, interactional synchrony, understanding intentions, and forming concepts based on experiential states. Theory of mind is not a strictly cognitive function but simultaneously emerges with the capacity for empathy. Empathy is based on emotional contagion when an observer is able to imitate the emotional state of the other. Based on this information, as the observer understands his or her own emotional state as "sadness," the observer is able to identify with the sadness of another.

Until recently, imitation was thought to be a fairly mindless behavior that did not contribute to human intelligence in any significant way (Garrels 2006). However, recent research has led to an important shift in understanding the role of imitation in several areas of human behavior including theory of mind and social learning (Hurley and Chater 2005). Many ethologists now agree that there are unique similarities between nonhuman primates and humans in their use of imitation in culture (Boesch and Tomasello 1998; Heyes 2001). Although there are differences between humans and other primates in the use and sophistication of imitation, imitation plays a unique role in both cultures and contributes to the maintenance of social relationships especially in regard to compassion and empathy, which are highly important to different forms of altruism.

An important neurological discovery inspiring research on imitation was the discovery of mirror neurons (di Pellegrino et al. 1992), which become activated through both the observation and the performance of a particular action. There seems to be a biological basis to the cognitive perception of an action and a corresponding behavioral imitation of that action. Giacomo Rizzolatti, Leonardo Fogassi, and Vittorio Gallese (2001) originally located these neurons in area F5 of the premotor cortex of the macaque monkey. This research has fostered investigation into the existence of a human neuronal mirroring system consisting of several areas of the brain including the superior temporal sulcus, the inferior parietal lobe, and the ventral premotor cortex, including Broca's area (Rizzolatti 2005). The biological basis of imitation in primates suggests some type of adaptive significance to this form of cognition and behavior. In fact, Merlin Donald

(1991) argues that imitation is an important stage in the evolution of human cognition that eventually culminated in the emergence of symbolic processing.

Facial imitation is apparently instinctual in human infants, according to several studies conducted by Andrew Meltzoff and M. K. Moore (1977; 1983; 1989). Newborn infants of various ages—21 days, 72 hours, and even 42 minutes—imitated several facial expressions of the researchers such as sticking out the tongue and opening the mouth. This type of imitation is likely closer to mimicry, which is an exact duplication of a specific behavior. Imitation involves adding some level of novelty to a copied behavior. In human imitation, the imitator copies a behavior but also shows some innovation in the application of the behavior to a specific task.

At this level of cognition, different processes become relevant to the discussion including reading intentions, which is a functional aspect of theory of mind. Meltzoff studied 18-month-old infants and their ability to read the intentions of others (1995). The babies watched adults attempting to pull apart a dumbbell-shaped object. Over several trials, they would succeed or fail at the task. However, the babies would pull apart the dumbbell whether or not they had watched an adult succeed. They were able to decipher the intention of the action and complete the task even if the adults had not. In another variation of the experiment, the dumbbell was glued together so that it was impossible to pull apart. After observing the adults, the babies would attempt to pull the dumbbell apart and would show frustration and gesture toward the adults with distressed vocalizations as if to indicate that they knew what to do but could not accomplish the task.

It is difficult to determine the extent to which other primates can understand the intentions of others within their own species and possess a theory of mind. An interesting anecdotal story about two chimpanzees, "Krom" and "Jackie," illustrates possible similarities between humans and other primates in terms of theory of mind (de Waal 2005). During cleaning at the Arnhem Zoo, several of the tires were hosed down, and the bottom of one tire filled up with water. The tires were hung on a horizontal log, and several tires that were to the outside of the log trapped the one with water. Krom tried in vain to release the tire from the log by pulling and tugging on it, but the other tires on one side and the climbing structure on the other trapped it. Meanwhile, Jackie had been watching Krom attempting to get to the water-filled tire. When Krom gave up after ten minutes, Jackie approached and took the tires blocking the water-filled tire off one by one until she was able to get to the one that Krom had wanted and brought it over to her. Apparently, she realized Krom's intentions and devised a scheme to accomplish the task.

Theory of mind is defined as a specific cognitive ability to correctly infer the thoughts of another person. One experiment to assess this ability

involves a cereal box filled with rocks (Levin and Beck 2004). Children are shown the contents of a cereal box that is filled with rocks rather than cereal. They are then asked what they think their parents will say is in the box without being able to open it. If they are able to comprehend that their parents will assume that there is cereal in the box rather than rocks, they have acquired theory of mind and are able to understand a situation from the perspective of another person. If they state that the parent will say there are rocks in the box, they are unable to differentiate their parent's mental state from their own.

Understanding the thoughts of others is partially based on emotional processes, which demonstrates a connection between empathy and theory of mind. Empathy is the foundation upon which theory of mind is built and serves emotional and social functions as well as cognitive ones. According to the perception-action model, the primary foundation of empathy is emotional contagion, when the autonomic states of the observer, such as heart rate and emotional arousal, begin to imitate that of the observed (Preston and de Waal 2002). In humans, the basis of an empathetic response typically involves interactions between parents and their children. This is a reciprocally imitative relationship in a dyad that is emotionally arousing for both parent and child, which serves as a motivating factor in the relationship. Marcel Kinsbourne defines this type of behavior as "interactional synchrony" (2005, 167), where the child responds and adjusts him- or herself to the rhythms of the adult.

Empathy for others builds on this simple process of imitating, feeling, and simulating the emotions of another. Meltzoff argues for a three-step process for understanding the thoughts, intentions, or emotional states of another called the "like me" hypothesis (Meltzoff 2005). The first step is imitation and, in the case of empathy, something akin to emotional contagion; this is an unconscious and immediate process relying on many of the instinctual aspects of imitation such as facial imitation. The second step is an experiential linkage between emotional autonomic reactions and some type of more abstract mental representation of a concept that describes that body state. Thus, crying, feeling depressed, and other autonomic responses become associated with the concept of sadness. In the third step, persons who are expressing similar emotional autonomic responses are interpreted as also experiencing sadness based on a projection from the observer to the observed. This is an emergent reciprocal process that develops over time. "Infants use other people to learn about and expand their own actions. The imitation of novelty suggests a bidirectional flow of information—a 'like you' as well as 'like me' pathway. . . . If infants can recognize when an entity is acting 'like me,' this would allow them to make a distinction between people and all other entities in the world" (Meltzoff 2005, 60). Using this process, we can share in the emotions of another and offer consolation and sympathy based on a shared experience. For the one

experiencing empathy from another, what often is most helpful is the realization that someone is correctly imitating my own emotional state and sharing it with me.

## The Expression of Compassion and Love

Empathy is the basis for compassion and love and an essential component of human altruism. The preceding section showed the cognitive and emotional factors involved in its formation. In this section I bring together the previous elements into an overall theological interpretation of the emergence of human altruism. In many respects, my scientific account is very similar to those offered by philosophical naturalists or atheists. The difference lies in the ultimate explanation for human altruism and its role in a divine purpose for human existence. A Christian theological account sees human altruism not as an accident but rather as an intention of the Creator. An evolutionary account of the components of human altruism, even one based on selfish genes, is not necessarily at odds with theology but demonstrates the possibility for altruism that exists within human nature.

Altruistic love is a specific type of love that is directed toward the other, often at personal cost or involving sacrifice on the part of the person enacting it. Thomas Oord offers a helpful definition of love based on research in science and religion: "To act intentionally, in sympathetic response to others (including God), to increase overall well-being" (2005, 924). A sympathetic act is a potential emotional and behavioral response that is part of the continuum of human nature along the two poles of self-concern and other-concern. Yet, the intentionality or directionality that channels this response toward another person can be difficult to define.

However, the intention of a sympathetic response of altruistic love can be understood by placing it within a theological framework, especially one that emphasizes the renunciation of the self and the kenotic nature of God's love. Within such a framework it is possible to see altruistic love and compassion as an outgrowth of or continuation of the natural properties of the goodness of creation. This is not a new idea; there have been several attempts to reconcile an evolutionary view of human nature with Christian theology. What is interesting is the extent to which recent developments in research on the cognitive and evolutionary factors involved in altruism (discussed earlier) continue to support this thesis. Historically, Thomas Aquinas and the theory of natural law have been associated with the recognition of the potentiality of virtuous acts as a natural disposition in human nature. As a consequence, there have been recent attempts to incorporate the work of Aquinas into an evolutionary framework (Arnhart 1998; Boyd 2007; Pope 2008; Porter 2005). In the *Summa Theologiae* Aquinas maintained that virtue was the perfection of the potentialities that existed within the created order of humanity, habits that exemplified goodness of character and obtained their full expression through the grace of God ([1912]

1981, I–II, q. 55, a. 1; q. 109, a. 1). For Aquinas, the natural law provides principles that are universally applicable to human nature; one of the most basic of these is the pursuit of goodness and the avoidance of evil (I–II, q. 94, a. 2). Thus, human altruism can be defined as a type of virtue, which is a potentiality that exists within human nature and ultimately is perfected through the grace of God according to the kenotic nature of the divine. The kenotic nature of God is experienced through participation in the Christian tradition, which attempts to embody and channel the intentionality of the altruistic response of compassionate love toward others.

The final move in defining the expression of compassion therefore is to position the evolutionary and cognitive processes involved in human altruism within a particular theological framework that specifies the intention or ultimate goal of compassionate love. Nancey Murphy and George Ellis argue that the hierarchy of science requires a theological or metaphysical framework to "top-off" the hierarchy (1996, 21). Theology is the most comprehensive level in the sciences because it studies the relationship between God and the universe (Peacocke 1990). A theological concept of the essential elements of human altruism provides a vision of the ultimate worth and value of compassion that is normative for the Christian community and not necessarily in conflict with its evolutionary emergence in nature. This is exemplified in several works that articulate a theological worldview that emphasizes the love of God without rejecting advancements in contemporary science (Polkinghorne 2001; Oord 2005; Murphy and Ellis 1996; Haught 1998).

This theological framework may conflict with other metaphysical systems such as philosophical naturalism or the new atheism. The conflict, however, has to do not with the science behind the evolution of human nature but with competing metaphysical claims about the ultimate significance of human altruism. For the theologian, the existence of human altruism reflects the compassionate nature of God enacted through the aspects of nature that were created as good. The atheist would reject the notion of any involvement of a supernatural being. This is a metaphysical disagreement, not necessarily a scientific one, and both the theologian and atheist rely on their own particular traditions in order to understand the ultimate explanation (assuming there is one) of the existence of altruism. The incorporation of evolutionary or cognitive factors and even the idea of selfish genes is not incompatible with a theological perspective that views creation as good, recognizes the possibilities that exist in human altruism, and seeks to encourage love and compassion in communities.

## Conclusion

It is possible to overcome the problems in selfish-gene theory through the incorporation of emergence into an understanding of the hierarchy of the

sciences. Additionally, a theological framework based on the kenotic nature of God can facilitate a new perspective through which to understand the contributions of evolutionary and cognitive functions in the emergence of human altruism by providing an ultimate purpose and intention for altruism in the world. The social bonding afforded by attachment is a consequence of the evolutionary process of kin selection. Although kin selection is not equivalent to altruism, it was one step that widened the circle of concern from pure self-interest to the interests of one's genetic relatives. Different forms of social cooperation have been demonstrated both in research on nonhuman primates and in the relatively new field of neuroeconomics. Social cooperation is a consequence of the evolutionary processes of reciprocal altruism, indirect reciprocity, and group selection, which increased the circle of concern from one's genetic relatives to others in the social group. Human altruism, although not reducible to evolutionary adaptations, emerged based on the contributions of these processes to the development of empathy. Empathy is based on the cognitive and emotional processes of imitation and theory of mind, which allow persons to imitate the emotional experiences of another and connect those experiences to conceptual representations. Evolutionary and cognitive factors are not necessarily at odds with a theological interpretation of human nature in regard to either the concept of sin or the emergence of altruism. A theological perspective can help to identify the ultimate intention and purpose of altruism in human nature and contribute to fostering its growth.

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