

# *Human Nature as Imago Dei*

with Helen De Cruz and Yves De Maeseneer, "The *Imago Dei*: Evolutionary and Theological Perspectives"; Aku Visala, "Imago Dei, Dualism, and Evolution: A Philosophical Defense of the Structural Image of God"; Olli-Pekka Vainio, "Imago Dei and Human Rationality"; Johan De Smedt and Helen De Cruz, "The *Imago Dei* as a Work in Progress: A Perspective from Paleoanthropology"; Tom Uytterhoeven, "Co-creating Co-creators? The 'Human Factor' in Education"; Johan De Tavernier, "Morality and Nature: Evolutionary Challenges to Christian Ethics"; and Taede A. Smedes, "Emil Brunner Revisited: On the Cognitive Science of Religion, the *Imago Dei*, and Revelation."

## THE *IMAGO DEI* AS A WORK IN PROGRESS: A PERSPECTIVE FROM PALEOANTHROPOLOGY

by *Johan De Smedt and Helen De Cruz*

*Abstract.* This article considers the *imago Dei* from the perspective of paleoanthropology. We identify structural, functional, and relational elements of the *imago Dei* that emerged mosaically during human evolution. Humans are unique in their ability to relate to each other and to God, and in their membership of cultural communities where shared attention, the transmission of moral norms, and symbolic behavior are important elements. We discuss similarities between our approach and the concept of *theosis* adopted in the Eastern Orthodox Church.

*Keywords:* *imago Dei*; Irenaeus; Maximus Confessor; moral awareness; paleoanthropology; shared attention; *theosis*

---

There is a growing tendency to incorporate empirical findings in theological discussions on the *imago Dei*. How can the biblical assertion that humans are created in the image and likeness of God (e.g., Genesis 1:27–28) be harmonized with evolutionary biological evidence? Does the concept of *imago Dei* carry the implicit claim that humans are unique, and if so, how can we understand this notion within an evolutionary framework? Contemporary theologians (e.g., Van Huyssteen 2006; Moritz 2012) turn increasingly to paleoanthropology as a source of inspiration for empirically informed

Johan De Smedt is a postdoctoral fellow in the Department of Philosophy and Ethics, Ghent University, Blandijnberg 2, 9000 Ghent, Belgium; e-mail [johan.desmedt@ugent.be](mailto:johan.desmedt@ugent.be). Helen De Cruz is a postdoctoral fellow of the British Academy at the Faculty of Philosophy, Woodstock Road, Radcliffe Humanities, University of Oxford, Oxford, OX2 6GG, United Kingdom; e-mail: [helen.decruz@philosophy.ox.ac.uk](mailto:helen.decruz@philosophy.ox.ac.uk).

accounts of the *imago Dei*. Paleoanthropology is the multidisciplinary study of extinct and extant hominins, combining principles and methods from, among others, paleontology, archaeology, primatology, ecology, and physical anthropology. Hominin evolution is examined using fossil hominin bones and other material evidence, including tools, archaeological traces of living sites, fossilized pollen, animal bones, and, more recently, DNA extracted from fossil remains. Paleoanthropologists also increasingly draw on neuroscience, developmental psychology, and comparative psychology to study traits that leave no direct material traces, such as social structures and emotions.

Paleoanthropological research reveals a complex picture of human evolution and the emergence of human-specific traits. In this article, we propose an empirically informed multifaceted approach to the *imago Dei*, with structural, functional, and relational elements. Scripture does not provide clear specifications on how the *imago Dei* should be understood. As a result, theologians have developed a wide variety of interpretations of this concept, including structural, functional, and relational views. Roughly, *structural* views focus on characteristics that humans uniquely possess (see Visala 2014, this issue, and Vainio 2014, this issue, for defenses of the structural view), *functionalist* approaches identify the image as something humans do, such as having dominion over creation, and *relational* interpretations argue that our unique relationship to God and other persons constitutes the *imago Dei*. *Multifaceted* approaches use a combination of any of these views; for example, Robert Jenson (1983) regards humans as praying animals, possessing a unique religious capacity, which is constitutive of the relation between humans and God.

According to our multifaceted approach, humans in the past and today form cultural communities that play a crucial role in shaping their thoughts and actions. Over time, culturally and cognitively structured capacities evolved, including the propensity to engage in joint attention, moral awareness, and the tendency to express thoughts symbolically. We do not claim that these constitute the only noteworthy elements of *imago Dei*; rather, we use them to illustrate a dynamic view of the *imago Dei* as a work in progress, a view initiated by Irenaeus and other patristic authors, and later developed in the concept of *theosis*. In what follows, we provide an outline of the paleoanthropological evidence for the evolution of these abilities, and discuss implications for the *imago Dei*. We start out by briefly reviewing current accounts that make use of paleoanthropological evidence. We then go on to develop a mosaic framework of the *imago Dei*. Finally, we consider broader implications of our approach for theological anthropology.

PALEOANTHROPOLOGY AND THE *IMAGO DEI*

Prior to the emergence of evolutionary theory, it seemed quite natural and self-evident to accord the status of *imago Dei* exclusively to humans. Indeed, in the Jewish and Christian exegeses of the rather scant mentions of *imago Dei* in the Hebrew Bible, there is a strong agreement that this concept applies to humans alone (Cortez 2010; Moritz 2012). This interpretation accords well with the intuitive distinction humans make between members of their own species and other animals. Most folk taxonomies place humans outside of the animal kingdom. In most of the world's languages, the term that translates most closely as "animal" excludes humans, and this is also the case in everyday parlance, as is clear in phrases like "no animals allowed." Children already make a human-nonhuman distinction at about 10 months of age (De Cruz and De Smedt 2007).

However, phylogenetic, behavioral, and anatomical continuities between humans and other species have prompted some empirically informed theologians to deny this anthropocentric notion of the *imago Dei*. Some animals exhibit properties originally seen as exclusive and defining human characteristics, such as morality, rationality, mathematics, and tool-use. If being in God's image is understood in structural terms, that is, in terms of having certain capacities or properties, it seems that we are forced to abandon the notion that humans *alone* are created in the image of God. For example, Oliver Putz (2009) rejects an ontological distinction between humans and other animals. Relying on empirical evidence in behavioral biology and cognitive ethology, he argues for a radical reconceptualization of the *imago Dei*: if humans only differ in degree from other animals, one ought to regard the whole of creation, rather than humans alone, as the image of God.

Other theologians have responded to the challenge of the evolutionary, genetic, and paleoanthropological evidence by maintaining the uniqueness of humans and their special relationship to God. We are just another unique species (Foley 1987): like other animals, we have apomorphic traits, that is, specialized features that arose within our clade to deal with specific ecological or social challenges. Examples of apomorphic traits in other animals include echolocation in bats and dolphins, the extreme color vision of mantid shrimps (with 16 color receptors, compared to our three), auditory maps in owls, and the ability to navigate using star constellations in indigo buntings. Paleoanthropologists have proposed that humans are unique in their reliance on cumulative culture (e.g., Richerson and Boyd 2005), or in their use of language and other symbolic systems (e.g., Tattersall 1998). Several theologians (e.g., Pannenberg 1970; Jenson 1999; van Huyssteen 2006) have taken this sense of human uniqueness—that is, humans having apomorphic cognitive and behavioral adaptations—as a cornerstone of their theological anthropology. These authors discern

a key stage in human evolution where humanity crossed the dividing line that sets humans apart from the rest of the living world. Jenson (1999, 59) identifies our ability to engage in religious reflection as the crucial characteristic: humans are “praying animals” (see also Jenson 1983). He interprets prayer broadly, that is, not only as linguistic expression, but also as ritual and the creation of religious art. He speculates that Adam and Eve were

[t]he first hominid group that in whatever form of religion or language used some expression that we might translate “God,” as a vocative . . . the first hominid group who by ritual action were embodied before God, made personally available to him. (Jenson 1999, 59–60)

Gijsbert Van den Brink (2011, 329) agrees with this view:

It may even be the case that . . . we just define the human being in terms of its remarkable capacity for answering God’s call in spirituality and religion, thereby simply denying hominids in whom this is missing the status of being “really” human.

Although Wentzel van Huyssteen (2005, 105) acknowledges that “no one trait or accomplishment should ever be taken as the single defining characteristic of what it means to be human,” it becomes clear throughout his writings that he regards the symbolic human mind as a crucial and dividing characteristic:

the way language can symbolically refer to things provides the crucial catalyst that initiated the transition from a species with no inkling of the meaning of life into a species where questions of ultimate meaning have become core organizers of culture and consciousness. (Van Huyssteen 2005, 117)

Van Huyssteen (2006, chapter 6) argues that what sets humans apart is culturally modern behavior<sup>1</sup> as it is expressed in the ability to engage in rituals and to use symbols in an artistic context. The earliest members of our species *Homo sapiens* (dated to 195,000 BP<sup>2</sup> based on fossil and genetic evidence) were *anatomically* modern, that is, had an anatomy similar to ours, but there is no evidence that they were *culturally* modern, that is, had a mind similar to ours: they did not have body decoration or other forms of art, religious material culture, or long-distance trade networks. Therefore, van Huyssteen places the emergence of cultural modernity quite late, in European Cro Magnon populations about 40,000 BP. He briefly notes recent South African findings like beads and engraved pieces of ochre from Blombos cave (around 75,000 BP) which seem to suggest that cultural modernity arose earlier and more gradually in Africa, but he goes on to focus his attention on the more spectacular painted cave walls of the Upper Paleolithic. By situating the emergence of uniquely human characteristics in the European Upper Paleolithic, van Huyssteen not only discounts

Neanderthals and other non-*Homo sapiens*, but also anatomically modern humans in Africa prior to 40,000 BP. Joshua Moritz (2012) criticizes this view, which he thinks is subject to an “anthropocentrism of the gaps”—that is, van Huyssteen poses an unwarranted discontinuity between symbolizing humans from the Upper Paleolithic and other hominins.

These theologians propose a clear dividing line between humans and other animals: at one point in human evolution one or a set of interrelated characteristics arose that made us the image of God. In this way, it becomes possible to straightforwardly re-interpret the biblical notion of the first humans in an evolutionary way. The first humans, in this view, were not the first hominins, but the first symbolizing, praying primates. However, these authors gloss over the fact that evolutionary continuity should not be gauged by comparing extant species (humans versus the rest of creation), but rather, by comparing extant species with their extinct ancestors and close relatives (the hominin clade). Today, we are the only remaining members of the genus *Homo*, but as recently as 30,000 years ago we shared the planet with at least five other hominin species: late *Homo erectus* and the tiny *Homo floresiensis* in Indonesia, two as yet unnamed late hominin species (one from Red Deer Cave, Southwest China, the other from the Denisova Cave, Siberia), and the Eurasian *Homo neanderthalensis*. Several of these species have left their genetic marks in our genome, indicating that past human populations did not impose strict species boundaries between each other. Also, behaviorally, there is a broad continuity between these extinct humans and *Homo sapiens*. Even if Wolfhart Pannenberg (1970, 8) is correct when he asserts a “profound distinction between man and all animals,” as we shall see, this profound distinction is less defensible when we compare contemporary humans with their extinct hominin relatives.

### A MOSAIC APPROACH

As an alternative to the dividing line approach, we propose a mosaic perspective that holds that human characteristics arose at different times during human evolution—actually an uncontroversial view within paleoanthropology and evolutionary biology. Mosaic evolution is a concept from evolutionary theory that states that evolutionary change can take place in some structures without affecting others. For instance, whereas today human anatomy is well adapted for bipedal locomotion, late australopithecines, and early *Homo* had an arm morphology that was adapted for climbing and a lower leg morphology that was capable of both climbing and bipedal locomotion (McHenry 1975). Cognitive capacities also evolve mosaically: within the clades of primates, bats, and birds, brain structures (e.g., for vision, locomotion, song learning, and echolocation) differ in relative size, according to selective pressures from diet, ecology, and social life in the history of individual species (Barton and Harvey 2000). Similarly, in

what follows, we will show that human cognitive specializations, including the ability for shared attention, moral awareness, and symbolism, evolved mosaically in the course of human evolution.

### SHARED ATTENTION

The relational view of the *imago Dei* posits that humans are special because of their unique relationship to God. Some contemporary authors (e.g., Moritz 2012) have proposed a thoroughly theocentric interpretation of this concept: it is God who elects humans as being in his image and likeness. However, relationships cannot be conceived of without positing at least some capacities to engage in them. If humans do not have any capacity to respond to God, they do not have a relationship with him, but more something like attachment. Nicholas Wolterstorff (2010, 359) invites us to imagine a particularly ugly stuffed animal, which is a young child's favorite. Despite its ugliness, the toy derives its value from the child's attachment. Similarly, according to Wolterstorff, God loves us with the love of attachment, and this love suffices to give humans their dignity. The problem with this analogy is that it conceives of the human relationship to God as a one-sided state of affairs. Humans are not merely passive objects of an attachment but have the capacity to engage in a relationship (see Smedes 2014, this issue, for an exploration of Emil Brunner's idea that humans have to possess certain natural capacities in order to grasp God's revelation and in order to have a relation with God).

Andrew Pinsent (2012) has recently drawn attention to the theological significance of a psychological phenomenon known as *shared attention*. Shared attention is the action by which two or more agents share attention over the same object. Crucial is that the agents know they are sharing attention—they are aware of the mental states of others. For example, a baby who points to a colorful balloon to direct her father's attention to it is attempting to share attention with him. This human capacity becomes manifest at about nine months of age, and further develops in the second year of life in activities like pointing (a nonverbal way of directing other people's attention) and pretend play. Sharing attention provides a phenomenological sense of being emotionally and cognitively attuned to someone else. According to Michael Tomasello and Hannes Rakoczy (2003), shared attention lies at the basis of human cumulative culture. Sharing attention allows us to learn, and build on, cultural solutions of others, for instance through teaching and imitation. Interestingly, although chimpanzees engage in dyadic interactions from birth (e.g., mothers and infants making eye contact), they do not share attention. The primatologists Masaki Tomonaga and colleagues (2004) observed many hours of exclusively dyadic interactions between chimpanzee infants and their mothers, but did not note a single instance of shared attention, even though they

tried to elicit it over objects between chimpanzee infant and researcher. For instance, young chimpanzees can follow a human's or chimpanzee's gaze (as adult chimpanzees can), but do not engage in reciprocal exchange, such as showing or handing over objects. On several occasions, the young subjects simply took away the object the experimenter tried to engage shared attention with, and started solitary play with it. Also, chimpanzee infants, unlike human infants, do not look at the experimenter's face after following gaze or pointing, which is one of the common behaviors of shared attention in human infants.

The oldest tangible evidence for shared attention can be found in the Oldowan, the earliest surviving human stone tool technology (about 2.6 to 1.5 million years BP). This technology required extensive cultural learning on a level beyond that observed in chimpanzee cultural traditions.<sup>3</sup> Oldowan tools are made by striking a stone (the core) with another stone (the hammer stone) on a striking platform (a flat surface of the core). Only an oblique angled strike results in a razor-sharp flake with a typical conchooidal (shell-like, concave) fracture pattern. Analyses of 2.4 million-year-old Oldowan artifacts from Lokalalei, Kenya (Delagnes and Roche 2005) show that hominins indeed chose the most efficient methods to flake tools in a way that is not likely to be learned by individual discovery, but that is critically dependent on imitation and teaching. They were also very selective in their choice of material, choosing only types of stone that would provide sharp flakes. These technological innovations may have been prompted by ecological conditions that early hominins faced. East Africa experienced progressive drying and cooling, which changed the ecology from rain forest into savannah. This made it increasingly difficult for hominins to rely on a diet mainly composed of fruit, as contemporary chimpanzees do. Scavenging, and later hunting, provided an alternative source of high-calorie food, but it required sharp tools to cut away meat from the carcasses and to crush the bones for marrow (Domínguez-Rodrigo and Barba 2006).

Shared attention is one of the cognitive mechanisms that facilitate cumulative cultural evolution. Because humans can engage in triadic interactions that involve objects, they can learn to imitate the behavior of others. This reduces the cost and time spent at individual learning, enabling learners to build upon, and improve inventions of previous generations. Comparative studies of social learning in children and chimpanzees reveal stark contrasts in the way new tools are used: whereas children take the intention of the person who demonstrates these tools as a guide, chimpanzees rely more extensively on the physical properties of the tools to figure out for themselves how they work (Horner and Whiten 2005). Dean et al. (2012), comparing the abilities of different primate species to solve complex puzzles in order to retrieve a food reward, found that only humans primarily engage in

imitation or teaching, capacities that critically underlie our ability to transmit complex cultural traits.<sup>4</sup>

Theologically, sharing attention is significant because it is critical for shaping and building relationships with others. This relation is not only horizontal (between humans) but also vertical (between humanity and God). Unlike finite beings, God (as conceptualized in traditional theism) can direct attention to all of creation, rather than shifting it selectively from one person to another. Nevertheless, a relationship with God can be conceived of as shared attention, as believers assume that God gives attention to them and other creatures, and aspire to share that attention through prayer, devotion, and practical life.<sup>5</sup> As Friedrich Schleiermacher expressed it in a sermon, to be a religious person and to pray are roughly synonymous:

To join the thought of God with every thought of any importance that occurs to us; in all our admiration of external nature . . . even in our most mirthful hours to remember His all-seeing eye: this is the prayer without ceasing to which we are called, and which is really the essence of true religion.  
(cited in Wyman 2006, 133)

Because sharing attention takes place in communities, not in isolated minds, humans need not be individually capable of it in order to share in God's image. For instance, shared attention is inhibited in autism or schizophrenia. People with these conditions have difficulties in sharing mental states of others, which in turn makes communication more challenging for them. Yet, these people, by virtue of their relationships with others, are consumers and producers of cumulative culture, and engage in activities that share attention with God (e.g., communal worship, religious art). Thus, even if sharing attention is a structural aspect of *imago Dei*, this does not mean that every individual has to be capable of it. Interestingly, this role of humanity was anticipated by Maximus Confessor (ca. 580–662), who proposed that humans are called to be priests of creation, that is, mediators who can help forge a bond between God and creation. In this picture, creation does not become a means to achieve individual goals, but a gift from God that can promote communion with God and with others (Bordeianu 2009). Shared attention makes it possible for humans to fulfill this mediating role.

#### MORALITY AND COMPASSION

Many contemporary theologians and philosophers (e.g., Hare 2004) regard morality as a unique and defining characteristic for humans. However, some ethologists (e.g., De Waal 2009) discern a broad continuity between human morality and altruism in nonhuman animals, for example, empathy, revenge, and reconciliation (see also De Tavernier 2014, this issue, for

discussion). In line with this, Celia Deane-Drummond (2009, 947) concludes, “we also need to be prepared to allow for the possibility of a form of animal morality.” While most evolutionary ethicists (e.g., James 2011) do not deny this continuity between animal altruism and human morality, morality has some unique features. In particular, it has a prescriptive, non-subjective character: we do not just abide by moral norms because we feel like it, but because we feel we *ought* to do so. There is at present no evidence for morality in this sense in nonhuman animals. A comparison with chimpanzees clarifies the discontinuity. Chimpanzees and other primates recognize when they are unfairly treated (e.g., when they receive a smaller reward than a conspecific), and protest when this happens. However, they are not averse to exchanges where they benefit more than others. When they get the opportunity of either delivering a food reward only to themselves, or the same reward to themselves and a familiar (unrelated) individual, they are just as likely to choose the selfish as the altruistic option, even though the latter does not cost them anything (Silk et al. 2014). By contrast, cross-cultural experiments (e.g., Henrich et al. 2006) indicate that humans are averse to inequality, even if they do not directly suffer from it. They are willing to punish someone, even if punishing is costly to them, if they think that this person has treated someone else unfairly. This preference for equal, rather than unequal sharing manifests itself in children from about age seven. In anonymous, one-shot games they are not only more likely to choose the altruistic option when there is no cost to themselves (e.g., where both they and a stranger get a candy, rather than just themselves). They are even prone to choose the fairer option, that is, subject and partner get one candy each, over an option that benefits themselves but not the other, that is, the child gets two candies, the partner none (Fehr et al. 2008). These studies suggest that people have a sense of fairness that goes beyond self-interest, one that is absent in nonhuman primates.

Morality in the strong sense is a distinct human-specific adaptation that arose in hominins as early as *Homo heidelbergensis* (evolved before 700,000 BP), the common ancestor of *Homo sapiens* and *Homo neanderthalensis*. *Homo heidelbergensis* evolved the capacity to internalize moral norms, which promote altruism in the face of conflicting selfish motivations. According to Benoît Dubreuil (2010), male members of this species engaged in high-stake cooperative activities such as large game hunting. Hunting large game collaboratively has a high payoff compared to pursuing small game individually, as a small prey can only feed an individual, whereas a large prey can feed several families. However, if one or more members of the hunting party defect (i.e., go off hunting by themselves), the costs are potentially high for the remaining hunters, as a lot of effort may be in vain since a smaller group may not be able to catch a large prey. Evidence of hunting weapons for large game, like the 400,000-year-old throwing spears from Schöningen (Germany), indicates collaborative hunting. These spears

were used to attack herds of horses, dangerous encounters that required the coordination and planning by a large hunting party.

Another incentive for close cooperation was the growing human brain size, which greatly increased the time and effort required for child rearing. *Homo heidelbergensis* had a brain size that lies within the lower normal range for current humans, at about 1000–1200 cc (Rightmire 2004). Brain tissue is metabolically expensive: a four-year old, for instance, uses up to 40% of her base rate metabolism to fuel her developing brain. Because of their large brains, hominin infants were weaned earlier than other primates: from about 6 months, they required some meat or other high-protein resources. As a result, hominins had shorter interbirth intervals than other apes. Chimpanzees have interbirth intervals of about 5 years, hunter-gatherers of only 2.5 years (Kennedy 2005). Hominin and (historical) human mothers required extensive cooperation from other members of the community to raise their offspring successfully, as they were often encumbered with several children at the same time. In contemporary hunter-gatherer communities, children typically have several alloparents, related and unrelated women and sometimes men who help raise them (Hrdy 2009). By contrast, chimpanzee mothers raise their single infants by themselves. Combined with the evidence for hunting, it is likely that *Homo heidelbergensis* formed enduring pairs, where sexual division of labor combined with high paternal investment ensured that children got enough protein to sustain their energy-guzzling brains. Studies of hunter-gatherer cultures indeed indicate that men provide up to 2/3 of their offspring's caloric intake, and most of their protein intake (Kaplan et al. 2000).

*Homo heidelbergensis* and its descendent species were confronted with several cooperative challenges. Collaborative large game hunting can only occur if hunting partners trust each other enough to invest time and energy in a collective hunt, with a return that is large enough to share with their dependents. Likewise, a group where many people invest in raising children has a better collective child survival rate, but this requires high levels of cooperation. Groups of hominins that were able to stick to moral norms, in the face of competing self-regarding motivations, had a higher fitness than groups where individuals were not. In such systems, individuals can gain short-term advantages by defecting (e.g., they depend on others as alloparents, but refuse to babysit). If too many group members do this, the system collapses, because the pooled contributions and benefits decrease. As a result, members of communities across the world (and of groups in laboratory experiments) are willing to punish noncooperators, as a means of providing an extra incentive to all group members to internalize norms and abide by them (Henrich et al. 2006). Punishment and the capacity to internalize culturally transmitted norms thus probably co-evolved in our hominin ancestors. Cultural factors play a role in specifying the content of moral norms in a process of gene-culture co-evolution. Co-evolutionary

models (e.g., Allison 1992) indicate that moral norms such as “love your neighbor” and “respect your elders” have a high chance of being maintained, because such norms increase the average fitness of a group: caring for one’s neighbor increases cooperation; respecting one’s elders helps the transmission of valuable knowledge from experienced members of the community to younger ones. Hominins need not be aware of the fitness benefits of such norms.

An ability to intellectually grasp moral norms may be a necessary but not a sufficient underpinning of human-specific altruistic behavior. For instance, sociopaths know the moral norms of their communities, but are less motivated to heed them due to a lack of compassion. Compassion is an emotion associated with love and commitment to others; it expresses itself in a motivation to act altruistically. Penny Spikins and co-authors (2010) argue that compassion is a key element in the evolution of human-specific moral behavior, and propose that it goes back at least to *Homo ergaster* (ca. 1.5 million years ago). Compassion is not a uniquely human emotion; it has been found in, among others, dolphins, primates, and rats. But its presence in other animals is more transient, for example, chimpanzees may hug the loser of a fight, but they never make allowances for individuals too weak and slow to keep up with the foraging group. By contrast, compassion in hominins is a far more integral part of group dynamics. It is not a transient emotion, but forms the basis of moral norms that prescribe protecting and helping vulnerable group members. It can motivate prosocial behavior toward those who may never be able to reciprocate, such as severely disabled infants.

Indubitable empirical evidence for compassion can be found in the abundant skeletal evidence for care for disabled individuals in *Homo heidelbergensis* and its descendant species. A 45-year-old male from Sima de los Huesos (Spain) suffered from substantial spinal lesions caused by Bastrup disease (Bonmati et al. 2010). This not only seriously impairs an individual’s capacity to walk and carry, but also causes severe and acute pain. The afflicted male would have been very likely unable to engage in hunting, which involved endurance running, throwing spears, and close contact with large animals. Yet, skeletal evidence indicates that he suffered from this condition during several years. Another individual from Sima de los Huesos, a ten- to twelve-year-old girl with a severe congenital brain impairment, also survived for years, indicating that members of her group took care of her (Gracia et al. 2010). A nearly toothless African *Homo heidelbergensis* with multiple cranial abnormalities caused by a bone disease survived into adulthood, despite his or her inability to chew hard food (Curnoe and Brink 2010). The majority of currently excavated adult Neanderthals had incurred severe traumatic injuries that had sufficient time to heal (Berger and Trinkaus 1995). Given the intensive method of Neanderthal hunting (running up to large animals and attacking them at

close range with spears and other weapons), and given that such injuries require at least 4 to 6 weeks of recovery time (in *Homo sapiens* who have access to modern medicine), this indicates that caring and providing for group members who were temporarily unable to care for themselves was widespread among Neanderthals. It is interesting to note that this form of care is not universal: more recent human societies, such as Medieval England, show archaeological evidence that infants with congenital deformities were abandoned rather than cared for by their community, a pattern not unlike that of other species (Spikins et al. 2010, 310).

This suggests that both culturally shaped moral norms and compassion played a role in prehistoric care for disabled individuals. Sustained care of severely disabled infants and other individuals is something we do not observe in the natural world prior to about 780,000 BP (Hublin 2009). Given that compassion, however fleetingly, also occurs in other species, we can infer that, by itself, this is not enough to sustain the kind of long-term care we see in *Homo heidelbergensis* and later hominins. Rather, sustained care required a combination of the ability to cognize moral norms, and compassion, which provides an emotive incentive to follow such norms. As with shared attention, moral behavior relies on an interplay of cognition and culture: *Homo heidelbergensis* and its descendant species formed communities with internalized moral norms that transcended transient feelings of compassion, and that, if needed, could be imposed on reluctant group members.

#### SYMBOLIC BEHAVIOR

In theological anthropological discussions, symbolic behavior is frequently hailed as a distinguishing feature of human behavior and thus as decisive for the *imago Dei*. As we saw, van Huyssteen (2006) proposes it as the dividing line between *Homo sapiens* and their hominin predecessors:

There is an unbroken continuity between human and nonhuman brains, and yet at the same time, there is a singular discontinuity between humans and nonhuman minds, between brains that use this form of communication [language] and those that do not. (van Huyssteen 2006, 234)

Relying on the work of paleoanthropologists like Richard Klein (1995) and William Noble and Iain Davidson (1996), he argues that this ability arose quite late, during the Upper Paleolithic in Europe, where the first archaeological evidence of figurative art appears in the form of cave art and mobiliary sculpture. While during this period we have definitive and direct evidence for symbolic reasoning, many paleoanthropologists do not share this “big bang model” of symbolic thinking, situating its appearance not in Europe, but in Africa, where our species emerged about 195,000

BP. Moreover, they argue that this change took place gradually and not suddenly (e.g., McBrearty and Brooks 2000).

The oldest tentative evidence for symbolism prior to the Upper Paleolithic includes beads made of perforated seashells found in Morocco, Algeria, and Israel, dated between 135,000 and 100,000 BP (e.g., Vanhaeren et al. 2006). Although a purely decorative, nonsymbolic function cannot be ruled out, it seems plausible that these beads—as in small-scale societies today—had symbolic meaning. At about 60,000 BP, complex abstract incisions appear on ostrich eggshell fragments in Diepkloof, South Africa (Texier et al. 2010). These fragments were likely parts of flasks that were used for storing and transporting water—ostrich eggshell containers are still used by southern African hunter-gatherers today. Many small-scale societies do not have representational art, but use stylistic abstract elements on functional objects like basketry, weaponry, and pottery as a way that denotes ownership or group membership. These elements encode social meaning, hence are without doubt symbolic (De Smedt and De Cruz 2011).

Anatomical and genetic evidence for one form of symbolism, language, indicate that it emerged prior to *Homo sapiens*. Given that the human-specific mutation in FOXP2, a gene crucial for articulate speech and speech comprehension, is found in both *Homo sapiens* and *Homo neanderthalensis* (Krause et al. 2007), we can push back the date for the emergence of symbolic competence in the linguistic domain to at least their common ancestor, *Homo heidelbergensis*. Indeed, human-specific adaptations for language, such as the shaping of the vocal tract and the inner ear, appear in *Homo heidelbergensis* fossils. Language evolved no later than 400,000 years ago, possibly as early as 1 million years ago (Johansson 2011).

Why then is there so little material evidence for symbolic reasoning prior to the European Upper Paleolithic? A plausible explanation may lie within the way people act within groups—symbolism and cultural modernity are not dependent on cognitive function alone, but also on cultural transmission. During the African Middle Stone Age (about 200,000 to 30,000 BP), increases in symbolic material culture correlate with growth in human population size (Powell et al. 2009). Symbolic behavior disappeared in archaeological sites when population size dropped due to climatological fluctuations, but reappeared whenever population size increased. The use of symbols in religious and artistic contexts requires a sustaining cultural environment, where these complex behavior patterns (e.g., engaging in rituals, making art objects) are transmitted through imitation, teaching, and other forms of sharing attention. The earliest firm archaeological evidence for religious thought appears in the form of therianthropic (half-human, half-animal) sculptures from Swabia, southwestern Germany, dating to about 40,000–35,000 BP (Conard 2003). From about 30,000 BP, entoptic signs (e.g., dots, spirals) decorate cave walls in the Dordogne, France which are

interpreted as indicative of shamanic trance (Lewis-Williams 2002). Prior to this, burial sites of *Homo sapiens* and Neanderthals since about 110,000 BP form the only tentative evidence for religiosity. However, these early burials do not contain grave gifts, and some archaeologists (e.g., Gargett 1999) even contest that they were intentional. Starting about 27,000 BP we see more definite evidence of intentional burial, including the presence of grave gifts (hinting at the belief in an afterlife), as, for example, in the double child burial at Sungir, Russia (Kuzmin et al. 2004). Like their hominin ancestors and extinct relatives, humans today are members of cultural communities, and it is by being brought up in such communities that they learn a sophisticated language, absorb religious beliefs, learn to perform rituals, and communicate through art objects.

Given the importance of a sustaining cultural environment for art and other forms of complex behavior, it seems unlikely that the earliest forms of religion could have emerged or been sustained if they were not rooted within communities. Even the most intense religious experiences are typically transient. But sharing such experiences with others, and offloading fleeting religious beliefs into material form (as in the representation of therianthropic sculptures and cave paintings) may have anchored them more durably in human lives. It is probably no coincidence that religions with fairly complex belief systems, such as Hinduism or the Australian Aboriginal Dreaming, have various ways to make these beliefs present and concrete by using visual art, music, and drama. In the Late Pleistocene, the emergence of music, dance, visual art, and other forms of symbolizing may thus have provided the critical step for the emergence of religion. In human evolution, humans first shared attention with each other, and later developed compassion for their close relatives and other group members. There is no archaeological evidence that these hominins had religious beliefs. Once symbolic behavior arose, building on these earlier capacities, humans were able to respond to and relate to God.

#### HUMANITY AS A WORK IN PROGRESS

In this section, we place our discussion within a broader theological anthropological framework. A paleoanthropological perspective on *imago Dei* strongly suggests that uniquely human capacities did not evolve in isolated minds, but within communities of interacting people. Moreover, these capacities did not emerge at a single point in human evolution, that is, there was no point in prehistory where hominins crossed “the threshold to being human in the morally and theologically relevant sense of the word” (Peterson 2008, 473). Instead, the *imago Dei* evolved, and continues to evolve. In the Christian tradition, the *imago Dei* finds its full realization in Christ; Eastern Orthodox theologians like Irenaeus and Maximus Confessor argue, in addition to this, that the rest of humanity will continue

to move toward God (Bordeianu 2009, 104). This dynamic image accords well with an evolutionary picture of humanity. Indeed, in such a view it is strange to ask when humans crossed the threshold to become the image of God, as divine image making is a dynamic process.

An advantage of stressing the importance of culture and community is that individual humans need not meet a set of well-established criteria in order to be in the image of God, as is the case in classic structural accounts. Such portrayals have tended to focus on properties that isolated individual minds possess, such as intellect or free will. However, as we saw, paleoanthropologists increasingly recognize that many human-specific cognitive capacities only originate, develop and flourish within communities. Hence, humans and past hominins are in the image of God by virtue of being members of cultural communities of shared attention, and later, morality and symbolism. Schleiermacher pioneered this approach in theology (Gunton 1996, 216), stressing the importance of the social, relational, and historical dimensions of human actions and capacities (Schleiermacher [1830] 1999, §67–69, §87–89). These cannot be understood in isolation, but rather, are developed through social transmission in cultural communities. It may be more productive to think of the structural elements of the *imago Dei* as expressing themselves in human communities, and being transmitted through a process of gene-culture co-evolution, rather than something that individual, isolated human minds either lack or possess.

Irenaeus' theological anthropology provides a promising model to understand the mosaic evolution of human capacities. Humans were not initially created in a state of perfection and righteousness, but rather in a state of immaturity and innocence (Irenaeus [2nd century] 1884, book III, 18, 22; book IV, 38; 1997, chapters 11–16). In this view, the *imago Dei* is not a finished product, but a work in progress. Irenaeus' notion of *imago Dei* as the outcome of a natural growth process has been mainly adopted in the Eastern Orthodox tradition, where it is regarded as a dynamic project with a clear teleology, the deification (*theosis*) of humanity (see Kärkkäinen 2004, chapter 3, for review). Humans are called to actively participate in sharing in the likeness to and union with God, a project that attains its full realization in Christ.

While some Western theologians have also adopted a (seemingly) dynamic view of *imago Dei*, their view is typically intimately tied up with the notion of the Fall and sin. The Fall marred the image that humans originally possessed, prompting the need for restoration. This tradition, coming from Augustine, teaches that humans, prior to the Fall, were in a state of original righteousness (e.g., Augustine [5th century] 1972, 13–14). This is a significant difference between Western and Eastern concepts of the *imago Dei*: only in the Eastern tradition do humans continue to develop from immaturity to a state that reflects God's image, thanks to the

gifts bestowed on them by God's grace. When attaining *theosis*, humans go beyond their prelapsarian state, that is, they do not merely return to the state of innocence prior to the Fall, but achieve fuller union with God. As a result of this, they arrive not only at a personal, spiritual transformation (as in the Western tradition), but also participate in the transformation of creation as a whole, as—to use Maximus Confessor's terminology (cited in Bordeianu 2009, 117)—mediators between the rest of creation and God. Although the Orthodox view emphasizes structural aspects of the *imago Dei* in that humans are actively called to reflect God in their actions, will and thoughts, *theosis* nevertheless remains a gift from God, a gift of grace (e.g., Ephesians 1: 3–14; 2 Peter 1:4), not something we can achieve autonomously (see also Deane-Drummond 2012 on the dimension of grace in Aquinas' work on the *imago Dei*).

Our account of the mosaic evolution of human-specific abilities resonates remarkably well with the Irenaean view of *imago Dei* and the Eastern Orthodox concept of *theosis*. As we saw, hominins over time acquired more capacities that enabled them to be in closer union with God, including the ability to share attention with him over creation, become compassionate and moral beings, and symbolically communicate with him in fellowship with other human beings. These evolutionary developments can be regarded as gifts from God that enable humanity to achieve *theosis*. In particular, they allow humans to fulfill a unique mediatory role between God and the rest of creation.<sup>6</sup>

Looking at the broader evolutionary picture, John Schneider (2012) concludes that the Irenaean view of original immaturity is much more plausible on an evolutionary understanding of creation than the rival Augustinian perspective:

The Irenaean original person—Irenaean Adam—fits remarkably well into the larger narrative of a Darwinian world and Darwinian Adam. With a little imagination, the Irenaean figure can adapt to the part naturally in unforced fashion. (Schneider 2012, 967)

We agree with Schneider that the dynamic view of human nature is more in line with human evolution than the Augustinian view. For one thing, there is no evidence that humans, at one distant point in their evolutionary history, were more righteous and wiser than they are today (for discussion, see De Cruz and De Smedt 2013). However, some difficulties remain. *Theosis* is an inherently teleological concept: humanity progresses toward a predetermined goal, a union with God. Contemporary evolutionary biologists are divided on whether teleology still has a place in evolutionary biology. Macro-evolutionary processes are not teleological, but teleology in individual adaptations like the eye can be the result of (unguided) design through natural selection (Ayala 1970). There was no inherent directionality in hominin evolution. It is a matter of luck and circumstance that *Homo*

*sapiens* remains the only surviving member of the genus *Homo*. Theists who accept evolutionary theory are faced with the following options:

Either

- (1) Stochasticity in natural selection is only apparent (mutations are not really unguided).  
Or
- (2) The apparent stochasticity in natural selection is real.

Alvin Plantinga (2011, 121) takes the first option. He denies that stochasticity is a central element of evolutionary theory, but rather, regards it as a philosophical (physicalist) gloss. In his picture, God guides every mutation that plays a productive role in the evolution of life forms, for example, by choosing what happens at the quantum level, allowing him to “guide the course of evolutionary history by causing the right mutations to arise at the right time and preserving the forms of life that lead to the results he intends.” The problem with this method of creation is that it seems to implicate God in an unacceptable amount of animal suffering that predates the evolution of hominins and that is a direct result of the winnowing process of natural selection. If God foresaw and directed all the relevant mutations to fulfill his creative intentions, why did he not create a perfect, prefab universe, with everything in place, but instead used the wasteful process of natural selection, which was bound to induce massive suffering?

Taking the second road, Elizabeth Johnson (1996) proposes that stochasticity is a real, not just an apparent feature of creation. Stochasticity and design are not incompatible, but rather, stochasticity can be an overall part of design. God may take risks in leaving the specific outcomes up to chance, but he uses natural selection and other natural processes to fulfill his creative and providential intentions. This picture specifies that some creatures can achieve a closer union with God through an alignment of humans with God’s will, concerns, and love. It does not specify that these creatures need to be bipedal or share our genome. In line with this view, John Haught (2000) regards divine providence essentially as self-giving love, and the contingency of natural selection as a manifestation of this love, as it fosters autonomy and independence in living things. Christopher Southgate (2008) regards the evolutionary process as the “groaning of creation” (Romans 8: 18–30), evidence that the whole of creation is a work in progress. One may object to this that taking risks with sentient creatures (with the possibility of losing the gambit) is not something a loving God would do. The stochastic view also comes with a cost: although not all of the suffering is foreseen, the process is one that generates suffering and its outcome is not known in advance. According to Southgate (2008), evolution is the only way by which God could have created a world with

a diversity of life forms, including those that are able to bear his image. Creation, as such, is perfect, but as it is a work in progress, it is at present incomplete.

### CONCLUSION

Applied to our discussion of human evolution, *theosis* is an overarching goal, but it is underdetermined because evolution is a stochastic process. In this way, *theosis* leaves room for genuinely contingent and stochastic processes to achieve God's intentions. For instance, it is in the evolutionary context of dietary innovations (scavenging and later hunting) that hominins acquired the capacities to engage in shared attention and to follow moral norms. This picture incorporates an overarching, broad teleology while allowing for genuine stochasticity in human evolution. Within Eastern Orthodox theology, *theosis* not only involves a transformation of individuals, but also achieves a closer relationship between creatures and their creator. Our dynamic view on *imago Dei* regards the gene-culture co-evolution of human capacities as a continuing work in progress. It is a multifaceted approach, which combines structural, functional, and relational elements in its recognition of human cognitive and behavioral innovations, such as shared attention, moral behavior, and symbolism, in acknowledging the unique role as mediators in creation that humans are called to fulfill, and in stressing the union with God through these capacities.

### ACKNOWLEDGMENTS

We would like to thank John Schneider, Kelly James Clark, Yves De Maeseneer, Willem Drees, and the participants at the workshop Human Evolution and the *imago Dei*, Oxford, March 27–28, 2012. This research was supported by a Templeton research fellowship at the University of Oxford, the Research Foundation Flanders, and by Ghent University.

### NOTES

This article grew out of a presentation at a workshop that took place at Kellogg College at the University of Oxford, March 27–28, 2012. The workshop was part of the research project “Anthropos” at the Catholic University of Leuven, a project that seeks to develop a renewed theological anthropology rooted in the Christian tradition and in dialogue with contemporary science and philosophy. The workshop was organized by Helen De Cruz and Yves De Maeseneer and received funding from Helen De Cruz’s Oxford Templeton Fellowship.

1. Cultural modernity is a term from archaeology that denotes behavior that typifies current and historical small-scale human societies (see, e.g., Wadley 2001). It includes the ability to use symbols, to engage in long-distance complex economic and social interactions, language, some form of social differentiation, religion and rituals, and a diversified and specialized material culture.

2. BP stands for ‘Before Present’; it is the standard way in archaeology to specify dates in the past. To avoid the problem of an ever-shifting present, by convention the term ‘Present’ refers to 1950, roughly the beginning of radiocarbon dating.

3. Both a chimpanzee (Kitahara-Frisch 1993) and a bonobo (Schick et al. 1999) have been extensively tutored in how to make Oldowan-type stone tools, but neither succeeded in striking the cores at correct angles. The flakes they were able to produce (e.g., by hurling the stones against the floor) did not exhibit the typical Oldowan conchoidal fracture pattern.

4. While there are some isolated reports of teaching in nonhuman primates, and an ability to imitate simple solutions has been demonstrated in chimpanzees, teaching does not form a central part of their cultural learning. For instance, chimpanzee mothers encourage their infants to experiment with tools (such as stones to crack nuts) but rarely correct them or interfere with their explorations. In experimental settings, chimpanzees (unlike humans) imitate only those solutions that are immediately obvious to them and that they could in principle have invented for themselves (see Matsuzawa 2007 for review).

5. We thank Willem Drees for this observation.

6. This view also allows for humans to reject this role, and instead uses their capacities to distance themselves from God—Maximus Confessor, for example, interprets original sin and sinfulness in this way.

## REFERENCES

- Allison, Paul D. 1992. "The Cultural Evolution of Beneficent Norms." *Social Forces* 71:279–301.
- Augustine. [5th century] 1972. *The City of God against the Pagans*, trans. William M. Green. Cambridge, MA: Harvard University Press.
- Ayala, Francisco. 1970. "Teleological Explanations in Evolutionary Biology." *Philosophy of Science* 37:1–15.
- Barton, Robert A., and Paul H. Harvey. 2000. "Mosaic Evolution of Brain Structure in Mammals." *Nature* 405:1055–58.
- Berger, Thomas D., and Erik Trinkaus. 1995. "Patterns of Trauma among the Neandertals." *Journal of Archaeological Science* 22:841–52.
- Bonmatí, Alejandro, Asier Gómez-Olivencia, Juan-Luis Arsuaga, José Miguel Carretero, Ana Gracia, Ignacio Martínez, Carlos Lorenzo, José María Bermúdez de Castro, and Eudald Carbonell. 2010. "Middle Pleistocene Lower Back and Pelvis from an Aged Human Individual from the Sima de los Huesos Site, Spain." *Proceedings of the National Academy of Sciences USA* 107:18386–91.
- Bordeianu, Radu. 2009. "Maximus and Ecology: The Relevance of Maximus the Confessor's Theology of Creation for the Present Ecological Crisis." *Downside Review* 127:103–26.
- Conard, Nicholas J. 2003. "Palaeolithic Ivory Sculptures from Southwestern Germany and the Origins of Figurative Art." *Nature* 426:830–32.
- Cortez, Marc. 2010. *Theological Anthropology: A Guide for the Perplexed*. London, UK: Continuum.
- Curnoe, Darren, and James Brink. 2010. "Evidence of Pathological Conditions in the Florisbad Cranium." *Journal of Human Evolution* 59:504–13.
- Dean, Lewis G., Rachel L. Kendal, Steven J. Schapiro, Bernard Thierry, and Kevin N. Laland. 2012. "Identification of the Social and Cognitive Processes underlying Human Cumulative Culture." *Science* 335:1114–18.
- Deane-Drummond, Celia. 2009. "Are Animals Moral? A Teleological Appraisal of the Evolution of Vice and Virtue." *Zygon: Journal of Religion and Science* 44:932–50.
- . 2012. "God's Image and Likeness in Humans and Other Animals: Performative Soul-making and Graced Nature." *Zygon: Journal of Religion and Science* 47:934–48.
- De Cruz, Helen, and Johan De Smedt. 2007. "The Role of Intuitive Ontologies in Scientific Understanding – The Case of Human Evolution." *Biology and Philosophy* 22:351–68.
- . 2013. "Reformed and Evolutionary Epistemology, and the Noetic Effects of Sin." *International Journal for Philosophy of Religion* 74:49–66.
- Delagnes, Anne, and Hélène Roche. 2005. "Late Pliocene Hominid Knapping Skills: The Case of Lokalalei 2C, West Turkana, Kenya." *Journal of Human Evolution* 48:435–72.
- De Smedt, Johan, and Helen De Cruz. 2011. "A Cognitive Approach to the Earliest Art." *Journal of Aesthetics and Art Criticism* 69:379–89.
- De Tavernier, Johan. 2014. "Morality and Nature: Evolutionary Challenges to Christian Ethics." *Zygon: Journal of Religion & Science* 49:171–189.

- De Waal, Frans. 2009. *The Age of Empathy: Nature's Lessons for a Kinder Society*. New York, NY: Random House.
- Domínguez-Rodrigo, Manuel, and R. Barba. 2006. "New Estimates of Tooth Mark and Percussion Mark Frequencies at the FLK Zinj Site: The Carnivore-Hominid-Carnivore Hypothesis Falsified." *Journal of Human Evolution* 50:170–94.
- Dubreuil, Benoît. 2010. "Paleolithic Public Goods Games: Why Human Culture and Cooperation Did Not Evolve in One Step." *Biology and Philosophy* 25:53–73.
- Fehr, Ernst, Helen Bernhard, and Bettina Rockenbach. 2008. "Egalitarianism in Young Children." *Nature* 454:1079–83.
- Foley, Robert. 1987. *Another Unique Species: Patterns in Human Evolutionary Ecology*. Harlow, UK: Longman.
- Gargett, Robert H. 1999. "Middle Palaeolithic Burial Is not a Dead Issue: The View from Qafzeh, Saint-Césaire, Kebara, Amud, and Dederiyeh." *Journal of Human Evolution* 37: 27–90.
- Gracia, Ana, Juan F. Martínez-Lage, Juan-Luis Arsuaga, Ignacio Martínez, Carlos Lorenzo, and Miguel-Ángel Pérez-Espejo. 2010. "The Earliest Evidence of True Lambdoid Craniosynostosis: The Case of "Benjamina", a *Homo Heidelbergensis* Child." *Child's Nervous System* 26:723–27.
- Gunton, Colin E. 1996. *Theology through the Theologians: Selected Essays 1972–1995*. Edinburgh, UK: T&T Clark.
- Hare, John. 2004. "Is There an Evolutionary Foundation for Human Morality?" In *Evolution and Ethics: Human Morality in Biological and Religious Perspective*, ed. Philip Clayton and Jeffrey Schloss, 187–203. Grand Rapids, MI: William B. Eerdmans.
- Haught, John F. 2000. *God after Darwin: A Theology of Evolution*. Boulder, CO: Westview Press.
- Henrich, Joseph, Richard McElreath, Abigail Barr, Jean Ensminger, Clark Barrett, Alexander Bolyanatz, Juan C. Cardenas, Michael Gurven, Edwins Gwako, Natalie Henrich, Carolyn Lesorogol, Frank Marlowe, David Tracer, and John Ziker. 2006. "Costly Punishment across Human Societies." *Science* 312:1767–70.
- Horner, Victoria, and Andrew Whiten. 2005. "Causal Knowledge and Imitation/Emulation Switching in Chimpanzees (*Pan troglodytes*) and Children (*Homo sapiens*)."*Animal Cognition* 8:164–81.
- Hrdy, Sarah Blaffer. 2009. *Mothers and Others: The Evolutionary Origins of Mutual Understanding*. Cambridge, MA: Harvard University Press.
- Hublin, Jean-Jacques. 2009. "The Prehistory of Compassion." *Proceedings of the National Academy of Sciences USA* 106:6429–30.
- Irenaeus. [2nd century] 1884. *Against Heresies*, trans. Alexander Roberts and William H. Rambaut. Edinburgh, UK: T&T Clark.
- . [2nd century] 1997. *On the Apostolic Preaching*, trans. John Behr. Crestwood, NY: St. Vladimir's Seminary Press.
- James, Scott M. 2011. *An Introduction to Evolutionary Ethics*. Chichester, UK: Wiley-Blackwell.
- Jenson, Robert W. 1983. "The Praying Animal." *Zygon: Journal of Religion and Science* 18: 311–25.
- . 1999. *Systematic Theology. Volume 2: The Works of God*. Oxford, UK: Oxford University Press.
- Johansson, Sverker. 2011. "Constraining the Time when Language Evolved." *Linguistic and Philosophical Investigations* 10: 45–59.
- Johnson, Elizabeth A. 1996. "Does God Play Dice? Divine Providence and Chance." *Theological Studies* 57:3–18.
- Kaplan, Hillard, Kim Hill, Jane Lancaster, and A. Magdalena Hurtado. 2000. "A Theory of Human Life History Evolution: Diet, Intelligence and Longevity." *Evolutionary Anthropology* 9: 156–85.
- Kärkkäinen, Veli-Matti. 2004. *One with God: Salvation as Deification and Justification*. Collegeville, MN: Liturgical Press.
- Kennedy, Gail E. 2005. "From the Ape's Dilemma to the Weanling's Dilemma: Early Weaning and its Evolutionary Context." *Journal of Human Evolution* 48: 123–45.
- Kitahara-Frisch, Jean 1993. "The Origin of Secondary Tools." In *The Use of Tools by Human and Non-human Primates*, ed. Arlette Berthelet and Jean Chavaillon, 239–46. Oxford, UK: Clarendon Press.

- Klein, Richard G. 1995. "Anatomy, Behavior, and Modern Human Origins." *Journal of Human Prehistory* 9:167–98.
- Krause, Johannes, Carles Lalueza-Fox, Ludovic Orlando, Wolfgang Enard, Richard E. Green, Hernán A. Burbano, Jean-Jacques Hublin, Catherine Hänni, Javier Fortea, Marco de la Rasilla, Jaume Bertranpetti, Antonio Rosas, and Svante Pääbo. 2007. "The Derived FOXP2 Variant of Modern Humans was Shared with Neandertals." *Current Biology* 17:1908–12.
- Kuzmin, Y. V., G. S. Burr, A. J. T. Jull, and L. D. Sulerzhitsky. 2004. "AMS  $^{14}\text{C}$  Age of the Upper Palaeolithic Skeletons from Sungir Site, Central Russian Plain." *Nuclear Instruments and Methods in Physics Research B* 223:731–34.
- Lewis-Williams, David. 2002. *The Mind in the Cave: Consciousness and the Origins of Art*. London, UK: Thames & Hudson.
- Matsuzawa, Tetsuro. 2007. "Comparative Cognitive Development." *Developmental Science* 10:97–103.
- McBrearty, Sally, and Allison Brooks. 2000. "The Revolution that Wasn't: A New Interpretation of the Origin of Modern Human Behavior." *Journal of Human Evolution* 39:453–563.
- McHenry, Henry M. 1975. "Fossils and the Mosaic Nature of Human Evolution." *Science* 190:425–31.
- Moritz, Joshua M. 2012. "Human Uniqueness, the Other Hominids, and 'Anthropocentrism of the Gaps' in the Religion and Science Dialogue." *Zygon: Journal of Religion and Science* 47:65–96.
- Noble, William, and Iain Davidson. 1996. *Human Evolution, Language, and Mind: A Psychological and Archeological Inquiry*. Cambridge, UK: Cambridge University Press.
- Pannenberg, Wolfhart. 1970. *What Is Man? Contemporary Anthropology in Theological Perspective*. Minneapolis, MN: Fortress Press.
- Peterson, Gregory R. 2008. "Uniqueness, the Image of God, and the Problem of Method: Engaging van Huyssteen." *Zygon: Journal of Religion and Science* 43:467–74.
- Pinsent, Andrew. 2012. *The Second-person Perspective in Aquinas's Ethics: Virtues and Gifts*. New York, NY: Routledge.
- Plantinga, Alvin. 2011. *Where the Conflict Really Lies: Science, Religion and Naturalism*. Oxford, UK: Oxford University Press.
- Powell, Adam, Stephen Shennan, and Mark G. Thomas. 2009. "Late Pleistocene Demography and the Appearance of Modern Human Behavior." *Science* 324:1298–301.
- Putz, Oliver. 2009. "Moral Apes, Human Uniqueness, and the Image of God." *Zygon: Journal of Religion and Science* 44:613–24.
- Richerson, Peter J., and Robert Boyd. 2005. *Not by Genes Alone: How Culture Transformed Human Evolution*. Chicago, IL: University of Chicago Press.
- Rightmire, G. Philip. 2004. "Brain Size and Encephalization in Early to Mid-Pleistocene *Homo*." *American Journal of Physical Anthropology* 124:109–23.
- Schick, Kathy D., Nicholas Toth, Gary Garufi, E. Sue Savage-Rumbaugh, Duane Rumbaugh, and Rose Sevcik. 1999. "Continuing Investigations into the Stone Tool-making and Tool-using Capabilities of a Bonobo (*Pan paniscus*)."*Journal of Archaeological Science* 26:821–32.
- Schleiermacher, Friedrich. [1830] 1999. *The Christian Faith*, trans. Brian A. Gerrish. London, UK: T&T Clark.
- Schneider, John. 2012. "The Fall of 'Augustinian Adam': Original Fragility and Supralapsarian Purpose." *Zygon: Journal of Religion and Science* 47:949–69.
- Silk, Joan B., Sarah F. Brosnan, Jennifer Vonk, Joseph Henrich, Daniel J. Povinelli, Amanda S. Richardson, Susan P. Lambeth, Jenny Mascaro, and Steven J. Schapiro. 2005. "Chimpanzees are Indifferent to the Welfare of Unrelated Group Members." *Nature* 437:1357–59.
- Smedes, Taede A. 2014. "Emil Brunner Revisited: On the Cognitive Science of Religion, the *Imago Dei*, and Revelation." *Zygon: Journal of Religion & Science* 49:190–207.
- Southgate, Christopher. 2008. *The Groaning of Creation: God, Evolution and the Problem of Evil*. Louisville, KY: Westminster John Knox Press.
- Spikins, Penny, Holly E. Rutherford, and Andy P. Needham. 2010. "From Homininity to Humanity: Compassion from the Earliest Archaiacs to Modern Humans." *Time and Mind* 3: 303–26.

- Tattersall, Ian. 1998. *Becoming Human: Evolution and Human Uniqueness*. Oxford, UK: Oxford University Press.
- Texier, Pierre-Jean, Guillaume Porraz, John Parkington, Jean-Philippe Rigaud, Cedric Poggenpoel, Christopher Miller, Chantal Tribolo, Caroline Cartwright, Aude Coudenneau, Richard Klein, Teresa Steele, and Christina Verna. 2010. "A Howiesons Poort Tradition of Engraving Ostrich Eggshell Containers Dated to 60,000 Years Ago at Diepkloof Rock Shelter, South Africa." *Proceedings of the National Academy of Sciences of the USA* 107:6180–85.
- Tomasello, Michael, and Hannes Rakoczy. 2003. "What Makes Human Cognition Unique? From Individual to Shared to Collective Intentionality." *Mind and Language* 18:121–47.
- Tomonaga, Masaki, Masayuki Tanaka, Tetsuro Matsuzawa, Masako Myowa-Yamakoshi, Daisuke Kosugi, Yuu Mizuno, Sanae Okamoto, Masami K. Yamaguchi, and Kim A. Bard. 2004. "Development of Social Cognition in Infant Chimpanzees (*Pan troglodytes*): Face Recognition, Smiling, Gaze, and the Lack of Triadic Interactions." *Japanese Psychological Research* 46:227–35.
- Van den Brink, Gijsbert. 2011. "Are We Still Special? Evolution and Human Dignity." *Neue Zeitschrift für Systematische Theologie und Religionsphilosophie* 53:318–32.
- Vanhaeren, Marian, Francesco d'Errico, Chris Stringer, Sarah L. James, Jonathan A. Todd, and Henk K. Mienis. 2006. "Middle Paleolithic Shell Beads in Israel and Algeria." *Science* 312:1785–88.
- Van Huyssteen, J. Wentzel. 2005. "Human Origins and Religious Awareness: In Search of Human Uniqueness." *Studia Theologica* 59:104–28.
- . 2006. *Alone in the World? Human Uniqueness in Science and Theology*. Göttingen, Germany: Vandenhoeck & Ruprecht.
- Vainio, Olli-Pekka. 2014. "Imago Dei and Human Rationality." *Zygon: Journal of Religion & Science* 49:121–134.
- Visala, Aku. 2014. "Imago Dei, Dualism, and Evolution: A Philosophical Defense of the Structural Image of God." *Zygon: Journal of Religion & Science* 49:101–120.
- Wadley, Lyn. 2001. "What is Cultural Modernity? A General View and a South African Perspective from Rose Cottage Cave." *Cambridge Archaeological Journal* 11: 201–21.
- Wolterstorff, Nicholas. 2010. *Justice: Rights and Wrongs*. Princeton, NJ: Princeton University Press.
- Wyman, Walter E. 2006. "Sin and Redemption." In *The Cambridge Companion to Friedrich Schleiermacher*, ed. Jacqueline Mariña, 12–49. Cambridge, UK: Cambridge University Press.