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ARTICLE

Reformed and evolutionary epistemology and the noetic effects of sin

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Abstract Despite their divergent metaphysical assumptions, Reformed and evolutionary epistemologists have converged on the notion of proper basicality. Where Reformed epistemologists appeal to God, who has designed the mind in such a way that it successfully aims at the truth, evolutionary epistemologists appeal to natural selection as a mechanism that favors truth-preserving cognitive capacities. This paper investigates whether Reformed and evolutionary epistemological accounts of theistic belief are compatible. We will argue that their chief incompatibility lies in the noetic effects of sin and what may be termed the noetic effects of evolution, systematic tendencies wherein human cognitive faculties go awry. We propose a reconceptualization of the noetic effects of sin to mitigate this tension.

Keywords Reformed epistemology · Cognitive science of religion · Noetic effects of sin · Evolutionary epistemology

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Introduction

Despite their divergent metaphysical assumptions, Reformed and evolutionary epistemologists[1] have converged on the notion of proper basicality. Both posit that some beliefs are justified even though they are not supported by arguments, and even though they are not indubitably evident to the senses. These properly basic beliefs include metaphysically significant beliefs that underlie our everyday actions and intuitions. Reformed epistemologists (e.g., Plantinga 2000) argue that belief in God can be properly basic; its cognitive structure is not different from commonsense beliefs like belief in the existence of other minds or belief in past events. Evolutionary epistemologists (e.g., Stewart-Williams 2005; Boulter 2007) take properly basic beliefs to include commonsense beliefs, such as an untutored belief in a mind-independent world, the existence of other minds, and the reliability of perception. Both epistemological programs have what Cohen (2002) has termed a basic knowledge structure, i.e., they hold that the reliability of knowledge ultimately can be traced back to the reliability of basic beliefs, which underlie the acquisition of other, higher-order beliefs. But Reformed and evolutionary epistemologists disagree about the mechanism by which these beliefs are formed. According to Reformed epistemologists (e.g., Plantinga 1993), God has designed the mind in such a way that it reliably aims at the truth, which includes the formation of theistic belief. By contrast, according to evolutionary epistemologists (e.g., Fales 1996), human cognition is the product of a purely naturalistic evolutionary process that has honed cognition in such a way that it produces truth-approximating beliefs.

Is the notion of proper basicality as developed in Reformed epistemology compatible with its naturalistic counterpart? On the face of it, it seems that one is forced to choose between a supernatural and a natural outlook on how beliefs are formed, and that this has divergent consequences for the justification of theistic belief. Plantinga (1993, chapt. 12), for example, has argued that metaphysically naturalistic explanations of human cognition are incoherent. His evolutionary argument against naturalism contends that, since unguided natural selection is not concerned with truth, but with survival and reproduction, we cannot expect on naturalistic grounds that our belief-formation mechanisms are reliable. Only a theistic picture of the world could provide us with warrant[2] for the proper functioning of our cognitive system—the warrant derives from the fact that God designed the mind in such a way as to reliably aim at the truth. However, the compatibility of Reformed and evolutionary epistemology deserves further scrutiny. Reformed authors like Plantinga (1993) do not rule out naturalistic explanations for the design of the human mind, but rather, reject metaphysical naturalism as a plausible explanation for proper cognitive function. Evolutionary thinkers, too, acknowledge that supernatural and natural explanations are not in principle incompatible; for instance, Dennett (2006, p. 25) writes “Notice that it could be true

[1] The term “evolutionary epistemology” will be used in a broad sense to denote the position that biological evolutionary mechanisms, in particular natural selection, are important in shaping cognition.

[2] Warrant is what makes justified true beliefs knowledge. According to Plantinga (1993), beliefs have warrant only if they are produced by one or more cognitive faculties properly functioning in a suitable environment, designed in such a way that they successfully aim at the truth.

that God exists, that God is indeed the intelligent, conscious loving creator of us all, and yet still religion itself […] is a perfectly natural phenomenon."

In this paper, we will take moderate naturalism (MN) as a methodological point of departure. When using the term 'naturalism', we will not be concerned with metaphysical naturalism—as this form of naturalism holds that there are no supernatural entities and this rules out any discussion of the compatibility between Reformed and evolutionary epistemology from the outset—but with epistemological naturalism, which is neutral with respect to metaphysical assumptions. Roughly speaking, epistemological naturalism is concerned with the extent to which we can use naturalistic methods to approach epistemological questions. Goldman (1999) distinguishes three forms of epistemological naturalism: scientistic naturalism, where epistemology is regarded as a branch of science, epistemic naturalism, where justification arises from empirical methods, and moderate naturalism, which he defines as follows:

> **MN** (A) All epistemic warrant or justification is a function of the psychological (perhaps computational) processes that produce or preserve belief.
> (B) The epistemological enterprise needs appropriate help from science, especially the science of the mind (Goldman 1999, p. 3).

In particular, we are interested in the psychological processes that underlie basic theistic belief. Our chief help from science in this endeavor will be, as Goldman (1999) suggested, a science of the mind, namely the cognitive science of religion, which studies the cognitive processes that underlie religious beliefs. We will assess to what extent Reformed and evolutionary epistemological accounts of these psychological processes are compatible. Note that this paper will not be concerned with the validity of Reformed and evolutionary epistemology as such, nor with problems associated with basic knowledge structure views. We will also not consider here whether Reformed epistemologists are correct in arguing for an epistemic parity between theistic belief and commonsense beliefs (see Axtell 2006 for a treatment of this question). We start out by noting that Reformed and evolutionary epistemology both rely on a Reidian interpretation of proper basicality. Next, we see that both epistemological approaches propose systematic tendencies of our cognitive capacities to go off-track through noetic effects of sin and noetic effects of evolution respectively. We then examine in detail a mixed view of proper basicality developed by Clark and Barrett (Barrett 2009; Clark and Barrett 2010, 2011) that takes into account both Reformed and evolutionary views on religious belief; we note a tension between their Reformed concept of sin and the cognitive science of religion, and offer a framework in which this tension is mitigated.

A Reidian interpretation of proper basicality

Drawing inspiration from the commonsense philosopher Reid (1764), both Reformed and evolutionary epistemologists hold that we are justified in trusting some of our beliefs without any arguments whatsoever to support them. These basic beliefs have warrant, not because they are supported by arguments, but because they are the outcome of well-designed cognitive systems. It is in this notion of design that Reformed

and evolutionary epistemologists differ. According to Reformed epistemologists, God has implanted in all human beings a *sensus divinitatis*, an innate propensity to form theistic belief in a broad range of environmental conditions. The warrant of this belief derives from the fact that God has designed the human mind to aim successfully at the truth. The *sensus divinitatis* was first posited by Calvin (1559 [1960], book I) to explain why religious belief is widespread and, to most people, intuitively compelling. The concept was adopted by Reformed thinkers in the 19th and 20th century, in particular Kuyper, Bavinck, and later Plantinga, Alston and Wolterstorff (see Sudduth 2009, for a review).

Evolutionary epistemologists reject the notion of purposive design in cognition, but rely on the concept of adaptive function. The adaptive function of a particular trait lies in its ability to increase the reproductive fitness of its bearer. In this view, commonsense beliefs, such as the belief in the reliability of induction, derive their warrant from the fact that natural selection favors belief-producing mechanisms that are truth-conducive, since it is more advantageous for an organism to have true beliefs than false ones (Quine 1975; Stewart-Williams 2005). We can expect that, on the whole, our cognitive faculties have been honed by natural selection in a way that makes them at least approximately truth-conducive. For example, Stewart-Williams (2005) presents an evolutionary argument for the justification of our belief in a mind-independent, external world:

> The idea of a mind-independent world is not derived from sensory experience. Instead, it must be a consequence of the innate design of our minds. The fact that any normal mind automatically assumes an objective and mind-independent external world may count as proof that such a world does exist (Stewart-Williams 2005, p. 794).

In order to apply the term "warrant" in an evolutionary epistemological context, the criterion of design needs to be replaced with the notion of adaptive function. In philosophy of biology, there are several approaches to the question of whether and how the notion of design can be employed. Many philosophers (e.g., Millikan 1984; Neander 1991) conceptualize biological function as a form of natural design. This is what Allen and Bekoff (1995) term the ND = F principle (i.e., natural design = function):

ND = F Trait T is naturally designed for X, iff X is a biological function of T.

Note that this does not require a conscious designer: the natural design is a consequence of the interactions of ancestral organisms that possessed T on their descendants' fitness. Philosophers using this principle are indeed quite adamant in their claim that biological function is a mind-independent, natural property of biological organisms. This explicitly does not involve any "goals and purposes of a conscious agent" (Allen and Bekoff 1995, p. 611). The ND = F principle can be used rather straightforwardly to apply a naturalistic version of warrant, whereby the purposive design of a creator is replaced by the purposeless design of natural selection. Some philosophers of biology (e.g., Cummins 2002) have criticized the ND = F principle because they think that normativity has no place in evolutionary biology. However, applying the notion of warrant in a naturalistic context seems to require some version of ND = F, because warrant is an intrinsically normative concept (the outputs of a cognitive capacity that

functions well have warrant, those of a cognitive capacity that does not function well lack warrant). For instance, Perlman (2010) writes:

> Evolution by natural selection shows us how and why parts get selected to have the structures they do, and it seems that they are selected, to a significant degree, according to whether or not they perform their function well. Well-functioning organs, parts, and processes make survival and reproductive success more likely (Perlman 2010, p. 55).

Accordingly, the outputs of a psychological trait T have warrant if T is naturally designed for tracking truth and if T is working in a congenial environment, whereby tracking truth is a biological function of T. Take as an example our ability to recognize faces, which we share with other primates. This is a highly specialized, innate psychological trait that allows us to correctly identify others based on small differences in the shape and proportions of their facial features. Its neural basis is the fusiform face area, a part of the cerebral cortex that is specialized in the processing of face-like stimuli, and that has characteristic features, such as a diminished ability to recognize inverted faces (Pascalis and Bachevalier 1998). Face recognition probably evolved as a means to visually recognize conspecifics, as diurnal primates have less developed olfactory capacities compared to other mammals, and therefore cannot easily recognize each other by smell. Hence, if walking in Broad Street, Oxford, one recognizes Richard Swinburne, the belief that Swinburne is in Broad Street has warrant, because it is the output of a properly working face recognition system, working in congenial circumstances (the face is clearly visible, not upside down, etc.).

Reformed and evolutionary epistemology employ an externalist form of justification: we need not know that or how beliefs are justified, it suffices that our cognitive processes are reliable to make them justified. Externalism does not require that the subject have any idea about the source of her basic beliefs. Even Reid (1785), who was a theist and believed that our commonsense beliefs are reliable as a result of divine design, argued that one does not need to be a theist to trust these beliefs:

> Shall we say, then, that this [commonsense] belief [in the reliability of our senses] is the inspiration of the Almighty? I think this may be said in a good sense; for I take it to be the immediate effect of our constitution, which is the work of the Almighty. But, if inspiration be understood to imply a persuasion of its coming from God, our belief of the objects of sense is not inspiration; for a man would believe his senses though he had no notion of a Deity. He who is persuaded that he is the workmanship of God, and that it is a part of his constitution to believe his senses, may think that a good reason to confirm his belief. But he had the belief before he could give this or any other reason for it (Reid 1785, book II, chapt. 20).

Bergmann (2002) has argued that one can easily apply Reid's philosophy in a theistic as well as a non-theistic framework, because, in both cases, we have nonpropositional evidence (in the form of basic beliefs) that our own cognitive faculties are

reliable[3]. As we need not be aware of the source of this nonpropositional evidence, it does not matter whether one postulates supernatural or natural design.

The noetic effects of sin and the noetic effects of evolution

Despite this Reidian outlook, our beliefs are sometimes off-track, and this needs to be explained. There is an interesting isomorphism in the way Reformed and evolutionary epistemologists attempt to deal with human cognitive shortcomings. Reformed epistemologists invoke the noetic effects of sin (NES) to explain unbelief and incorrect (religious) beliefs. Although NES are primarily invoked to explain incorrect religious belief or unbelief, they extend to other cognitive faculties as well. For instance:

> This is a cognitive limitation that first of all prevents its victim from proper knowledge of God and his beauty, glory, and love; it also prevents him from seeing what is worth loving and what worth hating, what should be sought and what eschewed. It therefore compromises both knowledge of fact and knowledge of value (Plantinga 2000, pp. 207–208).

NES are a result of the Fall, which negatively affected human cognitive faculties: the *sensus divinitatis* is corrupted in such a way that it causes some people to hold incorrect religious beliefs, or to make them resistant to its deliverances so that they come to hold no religious beliefs at all (Plantinga 2000).

Evolutionary epistemologists agree that evolutionary processes do not always produce truth-conducive cognitive mechanisms. The noetic effects of evolution (NEE) occur when truth and fitness do not correlate. According to naturalistic theories of mental content (e.g., Millikan 1984; Rowlands 1997), the proper function of our cognitive processes is to promote survival and reproduction. This function was acquired as a result of past interactions of an organism's ancestors with their environment. Since natural selection is concerned with fitness and not directly with truth, we can expect that human cognitive faculties will only spontaneously form true beliefs when this enhances their chances to survive or reproduce[4]. We define the term NEE in a fairly narrow sense, as follows:

> **NEE** Unwarranted basic beliefs that arise from the normal and proper functioning of human cognitive adaptations.

Humans can hold wrong basic beliefs as a result of cognitive malfunction, such as brain injury or mental disorder. A person with Capgras syndrome, for example, believes in the basic way that her friends and family have been replaced by identical-looking impostors. Since such beliefs are not the product of a properly working cognitive

[3] Alvin Plantinga (1993) would likely disagree with this, given his evolutionary argument against naturalism. In particular, he claims that because natural selection is not truth-tracking, our belief that our own cognitive faculties are reliable would not count as evidence.

[4] Note that, nevertheless, evolutionary epistemologists (e.g., Fales 1996) resist the radical skeptical conclusion that all our cognitive capacities would be systematically off-track. In this, they disagree with Plantinga (1993) and Stich (1990) who believe that an evolutionary point of view would call the validity of all our beliefs into question. For more on this, see De Cruz et al. (2011).

process, they are not NEE according to the definition provided above. NEE occur in neurologically healthy subjects and are not the result of cognitive malfunction. We will now briefly consider two instances of NEE: adaptive unwarranted beliefs and better-safe-than-sorry beliefs.

Adaptive unwarranted beliefs are perhaps the best-known instances of NEE. Examples include the placebo effect and the Lake Wobegon effect[5]. These beliefs are adaptive, regardless of their truth, because they increase propensity fitness[6]: placebo effects release endogenous opioids, which lower stress levels and modulate the subjective experience of pain (Petrovic et al. 2001); the Lake Wobegon effect entices people to invest more time and resources into their offspring (Wenger and Fowers 2008). McKay and Dennett (2009) have termed such beliefs "adaptive misbelief," but this is a somewhat misleading term, because in some cases, such beliefs happen to be correct. The placebo effect not only works for medical treatment without proven health benefits, but also for treatments that are truly effective, including conventional medicine (Kaptchuk 2002). And some parents are correct in believing that their children are brighter and prettier than average. But even when correct, such beliefs do not constitute knowledge under the reliabilist account of knowledge that Reformed and evolutionary epistemologists usually endorse. Thus, we will denote such beliefs as adaptive unwarranted beliefs.

NEE also occur because of the asymmetry between costs and benefits of detecting particular signals in the environment. If the costs or payoffs of false positives (detecting a signal in the environment where there is none) and false negatives (failing to detect a signal that is present in the environment) are asymmetric, natural selection will tend to promote beliefs that yield the highest payoffs or incur the least costs (Stephens 2001). Take agency detection: humans and other animals are prone to detect agency in the environment where none is present, e.g., mistaking wind rustling in the foliage for an approaching animal. This cognitive capacity generates an excess of false positives. The evolutionary rationale for this is that a false positive is less costly than a false negative, as the latter can result in a failure to detect a dangerous predator, a prey, or a potential mate, and the former only results in a small waste of time and energy.

There is an important difference between such better-safe-than-sorry beliefs and adaptive unwarranted beliefs. While adaptive unwarranted beliefs are adaptive regardless of their truth value, the agency detection capacity would not be adaptive unless it at least sometimes produces true beliefs. The false positives are the result of the asymmetry between the benefits from the accurate signal detection and the costs resulting from failing to detect the signal. So for the agency detection system, only beliefs that are false positives (e.g., an animal spotted in the distance turns out to be a piece of dead wood) are NEE and not beliefs that actually correctly detect agency (e.g., an animal in the distance turns out to be an animal).

[5] The Lake Wobegon effect is the propensity of most humans to believe that they themselves and their children are above average in every desirable respect.

[6] Propensity fitness conceptualizes fitness as the propensity of an individual organism to produce a number of offspring.

Evolutionary explanations of religious belief

We now turn to the science of the mind that will help us gauge the compatibility of Reformed and evolutionary epistemology. The cognitive science of religion (CSR) is an interdisciplinary research program that seeks to understand the cognitive roots of religious beliefs and practices by using data from developmental psychology, anthropology, neuroscience and cognitive psychology. Scholars working in CSR share the assumption that religion is a natural product of human cognitive capacities, by which they mean that religious beliefs arise spontaneously and early in development, without deliberation or explicit instruction, and exhibit stability across cultures (e.g., Barrett 2004; Bloom 2007). In CSR, several evolutionary hypotheses on the origins of religious belief are on offer. These hypotheses can be subdivided into two broad categories: adaptationist and byproduct explanations. As we will see in more detail, adaptationist explanations regard (some features of) religion as a biological adaptation, which directly enhances the propensity fitness of religious believers. Byproduct explanations regard religious beliefs as not adaptive in themselves, but as byproducts of normal cognitive capacities (which are adaptive). We will now examine two theories in CSR in more detail, one adaptationist and one byproduct explanation. We will see that in both types of explanation religious beliefs can be plausibly reconstructed as NEE, either as adaptive unwarranted beliefs, or as better-safe-than-sorry beliefs.

Religious belief as adaptive unwarranted belief

Some theorists (e.g., Sosis and Alcorta 2003; Bering 2011) regard belief in supernatural agents as an adaptation that helps us to cooperate better. Humans are cooperative animals: most cultural solutions to adaptive problems, such as building homes or procuring food, require extensive cooperation. However, there is always a temptation to reap short-term benefits by taking advantage and not reciprocating. To counter the risk of freeloaders, members of a cooperating group can impose punishment (Henrich et al. 2006). But for people living in large-scale societies direct punishment is not always possible. Policing institutions are a solution, but they are liable to corruption and even in the best of cases they are not always able to spot, let alone catch, freeriders. Belief in supernatural beings provides a possible solution to this problem by positing one or more invisible, superknowing agents with moral properties who detect and punish uncooperative behavior (in this life or the next).

Experimental studies indicate that participants are less likely to cheat and are more generous toward others when they are made to believe that there is a supernatural agent, such as the ghost of a deceased student, in the room where the experiment takes place (Bering et al. 2005), or even when they are simply primed with religiously-laden words, such as "spirit" (Shariff and Norenzayan 2007). Members of religious communities also exhibit higher levels of cooperation compared to secular communities, as is indicated by a greater willingness to share resources with other members of the group: religiously-oriented 19th-century communes were more resilient to disintegration as a result of free riding than secular ones (Sosis and Alcorta 2003). Belief in superknowing and punishing supernatural agents thus helps people to cooperate better. Although the

best-known example of a punitive, moral deity is the Judeo-Christian God, members of small-scale societies also believe in watchful and punishing supernatural beings, such as the ancestral spirits of the Kwaio Solomon Islanders (Norenzayan and Shariff 2008). On the basis of this, Bering (2011) argues that theism is an adaptive unwarranted belief because there is no proper relationship between religious beliefs and the existence of God: the enhanced cooperation is achieved regardless of whether supernatural beings really exist. By contrast, a theistic adaptationist can argue that if theism is true, there is a connection between the belief in and the existence of God. In order to rule out theism, Bering (2011) appeals to auxiliary assumptions such as parsimony; while he briefly considers the possibility that God instilled religious beliefs in humans indirectly through natural selection, he argues, "If scientific parsimony prevails […] such philosophical positioning becomes embarrassingly like grasping at straws" (Bering 2011, p. 196)[7].

Religious belief as better-safe-than-sorry belief

An influential byproduct account of religion is Guthrie's (1993). Guthrie sees belief in supernatural entities as a better-safe-than-sorry belief: religious concepts are a byproduct of our capacity for agency detection. The proneness to detect agency is found in many animals, and is exploited in mimicry. For example, most caterpillars of the hawk moth family (*Sphingidae*) have a final abdominal segment that bears an uncanny resemblance to a snake's head, thereby deterring predators from eating them (eliciting a false positive).

Guthrie further develops Darwin's (1871) argument that religion is a form of animism that has ancient evolutionary origins: he discusses horses that shy away from bags and leaves that move in the wind, as if they interpret them as agents. Guthrie (1993, chapt. 7) speculates that the earliest religious beliefs stem from the misattribution of agency, e.g., rustling in the foliage and gurgling water are interpreted as caused by an agent, and this leads people to posit the existence of sylvanian and riverine spirits. As in the adaptationist explanation, this better-safe-than-sorry account only seems plausible if one assumes that theism is false, because one could dismiss the detection of all supernatural agents as a false positive under this assumption. Under a theistic account, the detection of some supernatural agents may be regarded as the output of a well-functioning cognitive system, much like when it detects other agents, such as conspecifics and other animals.

For nontheists, belief in God can be plausibly construed as NEE, since they regard it as an unwarranted belief that results from the normal and proper functioning of our cognitive adaptations (e.g., Bloom 2007; Bering 2011). By contrast, for theists, unbelief results from NES. NES comprise unbelief and incorrect religious beliefs, whereas NEE include all religious beliefs. As Bloom (2009) succinctly sums up the incongruity:

[7] Note, however, that Bering's inference to atheism from parsimony is less straightforward than it appears. Swinburne (2004) holds that the simplest explanation for the existence of the universe is to postulate a simple (undivided) being, God, who freely chooses to create and to sustain it—quite a different appeal to parsimony.

> Plantinga […] concedes that certain views about the origin of religious belief do portray the believer as cognitively defective, an 'intellectual gimp', but goes on to argue that under a different psychological account the same accusation—or worse—can be made about the *atheist* (Bloom 2009, p. 126, his emphasis).

If theistic belief is a NEE, it can never be warranted (as the Reformed view proposes), since NEE are per definition unwarranted. This would make the prospects of reconciling Reformed and evolutionary epistemology bleak.

Reconciling Reformed and evolutionary epistemology?

In a number of papers philosopher Kelly James Clark and cognitive psychologist Justin Barrett (e.g., Barrett 2009; Clark and Barrett 2010, 2011) have provided what is arguably the most developed empirically-informed account of the *sensus divinitatis*. Clark and Barrett (2010) hold that CSR provides empirical support for the Reformed claim that normal human cognition spontaneously and non-inferentially produces religious beliefs under a broad range of conditions. Their proposed *sensus divinitatis* is a combination of Guthrie's (1993) agency detection mechanism and the natural human ability to understand other minds (theory of mind). Barrett et al. (2001) showed that young children are able to understand that God is omniscient before they understand the limitations of other minds: using a simple task that required children to attribute beliefs to God, mother, and other agents, they found that three-year-olds actually start out by attributing omniscience to all agents, and only later, at the age of 4 or 5, restrict this to God. Barrett (2009) concludes that young children are "prepared" to think about agents with special knowledge properties. He regards this intuition of omniscience as part of our innate knowledge of God. Clark and Barrett (2011) contend that CSR provides evidence for the proper basicality of theistic belief, and develop a Reidian account of it: like other basic beliefs, religious beliefs are innocent until proven otherwise, and we are justified in holding such beliefs in the absence of arguments. This Reidian account is in line with other Reformed interpretations of the *sensus divinitatis* (e.g.,Wolterstorff 1983).

An obvious point of divergence from standard evolutionary accounts is the origin of the *sensus divinitatis*, either as a result of divine design or of a contingent evolutionary process. To lift this tension, Barrett (2009) proposes a theistic evolutionary model of religious beliefs: God, by way of natural selection, made human cognition in such a way that it spontaneously forms theistic belief. Under this theistic evolutionary construal, theistic belief is warranted, because it is produced by a properly working cognitive system that is functioning according to a design plan (albeit one that is carried out through evolutionary processes).

However, CSR does more than explain theistic belief. As a research program, it is committed to explaining not only major world religions, but also a broad range of other religious beliefs, including shamanism, totemism, and belief in witchcraft and beings like elves. CSR explains successfully why people adhere to such beliefs, and as such, does not privilege the cognitive status of the Christian theism that Reformed epistemologists endorse. As we have seen, belief in ancestor spirits or in punitive moral Gods are both effective in inducing cooperation. How can the broad scope of

CSR be reconciled with the Reformed idea that our natural knowledge of the divine is the output of a well-functioning cognitive system, designed by the God of Christianity? In Reformed epistemology, NES are invoked to explain incorrect religious beliefs. Barrett's mixed view, similarly, holds sin responsible. He wonders why cognitive dispositions encourage belief in supernatural beings, rather than only belief in a specifically monotheistic God:

> One possible answer is that a perfectly adequate concept of God does come as part of our biological heritage but that living in a sinful, fallen world this concept grows corrupt as we grow. If not for broken relationships, corrupt social structures, flawed religious communities, and the suffering that people inflict upon each other, perhaps children would inevitably form a perfectly acceptable concept of God. The diversity in God concepts we see is a consequence of human error and not divine design. The biblical story of Adam and Eve suggests a similar account. When Adam and Eve rebelled from God's reign, one consequence was banishment from His direct presence […] their decision to make their own decisions—to be like Gods—created not just relational separation from God but cognitive separation as well (Barrett 2009, pp. 97–98).

At first sight, this mixed view seems attractive, because it is respectful to cognitive science and yet preserves key concepts of Reformed epistemology, including the *sensus divinitatis* and NES. However, is there any empirical evidence that the initial state of religious beliefs, prior to the Fall, included, in Barrett's (2009, p. 97) words a "perfectly adequate concept of God"? Although it is difficult to assess past religious beliefs, anthropological, historical, and archaeological evidence indicates that monotheism is a relatively recent cultural development that is strongly dependent on literacy, social stratification, and agriculture (Sanderson and Roberts 2008). Roes and Raymond (2003) find a strong positive correlation between monotheistic belief in moralizing gods and group size, indicating that only large-scale societies (which emerged during the past 10,000 years) tend to develop monotheistic beliefs. The earliest firm archaeological evidence for religious thought in the form of entoptic signs on cave walls and sculptures of therianthropic (half-human, half-animal) beings dating to about 30,000 years ago, suggest that the earliest religious concepts in human prehistory were not at all like the Abrahamic monotheistic God, but rather, consisted of a rich supernatural world that included animals, humans and intermediate forms (see e.g., Mithen 1996; Lewis-Williams 2002). The fact that monotheism emerged more recently than other (e.g., animistic, polytheistic) religious beliefs casts doubt on the view that prelapsarian humans were originally monotheistic, and subsequently lost this original religion as a result of the Fall.

Noetic effects of sin reconsidered

To examine whether NES can be brought in line with NEE, we need to consider the concept of sin within a moderately naturalistic framework. Although sin is a theological concept, it has been applied in philosophical discourse, e.g., in Reformed epistemology, where, as we saw, it is invoked to explain human cognitive shortcomings.

An empirically-informed examination of NES needs to bring the notion of sin in line with scientific findings, such as those from paleoanthropology, genetics and CSR[8].

The traditional theological concept of sin, as developed by Augustine and affirmed in, amongst others, the Augsburg confession has four key elements: (1) adult humans actually sin, (2) humans have, from birth, a proneness to sin that they inherit biologically, (3) the origin of this biologically transmitted propensity is the first sin (original sin), committed by the earliest humans, (4) the state of the first humans, prior to their sin, was one of perfection (original righteousness), a state from which they fell (Augustine, 5th century 1972, p. 13, 14)[9]. There is growing dissent to this Augustinian picture, in particular to (3) and (4): empirically-informed theologians (e.g.,van Huyssteen 2006; Harlow 2010; Schneider 2010) argue that, given the current fossil and genetic evidence, it is hardly reasonable to maintain that all humans descended from a single, ancestral couple that brought about the Fall. For one thing, mitochondrial and y-chromosomal evidence indicate an ancestral human population of at least a few thousand individuals since the split between our ancestors and those of the chimpanzees (Venema 2010).

Nonetheless, one might recast portions of the Augustinian concept of original sin in terms that are compatible with our current understanding of human evolution. The historicity of the first sinners might be salvaged if one assumes that they were not necessarily the earliest *Homo sapiens*. In this picture, they would be the first morally and religiously aware hominids, which were ancestral to extant humanity. The mode of transmission of the original sin committed by this ancestral group of first sinners constitutes a bigger problem. We briefly mention two possible ways of transmission that would be in line with evolutionary theory. Richard Swinburne, upon reading this paper, suggested that sin might be transmitted in an epigenetic way, since there is no mechanism for its transmission in classical genetic terms. Alternatively, sin could be propagated through a gene-culture co-evolutionary process, in line with theological views on sin that stress its social nature: Jenson (1999, chapt. 22), following Schleiermacher, argues that we are members of a diachronically extended community of sinners. Nevertheless, as we shall see further on, the concept of original sin is hard to maintain within an evolutionary epistemological framework.

An examination of our closest living relatives, the chimpanzees, indicates that it is unlikely that ancient hominids were in a state of moral perfection. Like chimpanzees, hominids vied for power and status by making opportunistic alliances and resorting to violence (Wrangham and Peterson 1996). Skeletal remains of ancient hominids from the Middle Pleistocene onward (ca. 780,000 years ago) indicate traumatic injuries that were the result of interpersonal violence, often caused by weaponry (McCall and Shields 2008). Compared to other primates, present-day humans (especially those living in large-scale societies) are remarkably peaceful. However, this does not mean that we can simply equate sin with our evolved tendencies for self-preservation and aggression. Tennant (1906) already acknowledged that we cannot sensibly apply the

[8] One of the earliest attempts to do this was Tennant (1906), who argued that Augustine's concept of original sin should be abandoned in the light of evolutionary theory.

[9] For a review of the Augustinian concept of original sin, see Swinburne (1989, chapt. 9) and Jenson (1999, chapt. 22).

notion of sin to nonhuman agents; we cannot use ethical standards to say that a cat playing with a mouse is being cruel. An ability for moral reflection and a grasp of moral norms are necessary conditions to attribute sinfulness, for an animal without these faculties cannot bear responsibility. At present, there is no agreement among comparative psychologists[10] on when this capacity for moral reflection arose (see e.g., Silk and House 2011, for an overview). What one can say, at the very least, is that many propensities considered sinful in humans (e.g., greed, ambition, lust) are present in monkeys and apes as well, which makes it unlikely that these tendencies could have been caused by a single human historical act (Swinburne 1989). The fourth key element in the Augustinian view on original sin cannot be brought in line with evolutionary theory, but then again, it is a weak element. As Wyman (1994), in his discussion of Schleiermacher's Irenaean doctrine of sin, points out, there are also theological reasons for rejecting the Augustinian view of prelapsarian perfection. It seems incoherent to claim that humans could be tempted to sin if they were in a state of moral perfection. That they were so tempted seems to suggest the propensity to sin was already present in them. Augustine actually concedes as much (Augustine, 5th century 1972, chapt. 14:13).

Irenaeus of Lyons offers the best-known alternative interpretation of sin, and, as we shall see, his is more congenial to an evolutionary reinterpretation of NES than the Augustinian view. He is part of a minority tradition in western Christian theology that has been recapitulated by theologians like Thomas Traherne (Grant 1971), Friedrich Schleiermacher (Wyman 1994), Frederick Tennant (1906), and John Hick (1966). According to Irenaeus[11], humanity did not begin in a state of perfection, but rather, in a not fully developed condition. The first humans were not morally perfect, but in a state of moral innocence (like nonhuman animals). Although Irenaeus also thought about the Fall in terms of a factual historical event, its historicity was not central to his notion of sin, nor did he regard it as an act that tainted subsequent humankind. Rather, he saw the Fall as a representation of the loss of this state of moral innocence (Jacobsen 2005). Under this view, it is possible to perceive sin not as the outcome of a single historical event, but as tendencies to be morally or cognitively off-track. The Irenaean view of sin fits better with our understanding of humans as the result of a gradual, evolutionary process. If this Irenaean picture is correct, NES are not the result of a historical Fall, but they have emerged as a consequence of our evolutionary history. This does not mean that we can simply equate NES with our evolutionary history, since, arguably, our capacities, for, say, rationality and altruism are also the result of evolutionary processes. But it does suggest that we can find the origin of NES in evolved propensities.

An example from the CSR literature can illustrate this. Ancestor worship is a cross-culturally salient religious practice, appearing in small-scale as well as more complex societies (Steadman et al. 1996). Burial practices with lavish grave gifts provide good evidence that ancestor worship extends back in time into at least the early Upper Palaeolithic, ca. 30,000 years ago (Rossano 2010, pp. 64–65). Beliefs that lie at the

[10] Comparative psychology is that branch of psychology that studies cognitive capacities and behaviors of nonhuman animals, e.g., comparing human cognition and behavior with that of other primates.

[11] See e.g., Irenaeus (2nd century [1884], book III, chapts. 18, 22, book IV, chapt. 38; 2nd century [1997], chapt. 11–16).

basis of ancestor worship are usually one or both of the following: the ancestors have a continued existence after death, and they have the ability to actively influence the fate of the living. While some forms of ancestor worship are primarily expressions of filial piety (i.e., fulfilling duties of paying respects toward one's ancestors), others express the belief that the ancestors have become deities themselves. Theologians (e.g., Jenson 1999, pp. 134–141) regard this belief as a NES, since it is a form of idolatry.

There are several reasons why the human brain exhibits evolved tendencies that make it prone to beliefs that lead to ancestor worship. First, they are byproducts of our evolved ability to attribute mental states to others. Upon the physical death of a known person, we spontaneously continue to attribute mental states to the defunct (e.g.,"grandpa would never have approved of this"). This is what Bloom (2007) has termed our intuitive body–soul dualism: our attribution of mental states is separate from our reasoning about physical bodies. Second, ancestors are members of social communities, engaged in a social web of interactions that does not spontaneously disintegrate upon their death. Although members of the deceased's social network realize that she is biologically dead, this does not preclude engagement with her in a social way. Ancestor worship is a way to preserve these social relationships by giving the dead agent an established place in society (Hodge 2011). The example of beliefs involved in ancestor worship indicates that at least in some cases NES can be subsumed under NEE, because they are byproducts of evolved tendencies in the domains of mental state attribution and social interaction. One problem yet remains: how can such NES be isolated from warranted religious beliefs? As we saw, CSR does not make a distinction between idolatrous and proper religious beliefs.

In response to this worry, it may be more productive to view the *sensus divinitatis* as underspecified, rather than corrupted (the prevailing view in Reformed epistemology). Human evolutionary history did not end with the emergence of *Homo sapiens*; we rely to a unique extent on culturally transmitted information. In line with the Irenaean theological anthropology, which conceptualizes humans as immature and in need of further development, cultural evolution is an important part of our continuous development. Many human cognitive capacities are underspecified, and require cultural input for their proper functioning. To name but two, our evolved number sense and language faculty require a sustaining cultural environment for their proper functioning. Few would argue that these faculties are defective or broken because they want cultural input for their proper development. Likewise, an untutored *sensus divinitatis* needs to be supplemented with other sources of knowledge, such as culturally transmitted Scripture[12]. Thus, the beliefs underlying ancestor worship in the Irenaean sense stipulated here are not sinful in the sense of corrupted, but in the sense of underspecified.

What belief in God would untutored individuals end up with if they only had the intuitions that CSR has uncovered? This would be a form of thin theism. The current CSR evidence indicates the following rough picture of our natural knowledge of God: there exist one or more supernatural agents, who have intentions, desires and beliefs (following Guthrie 1993). This being (or these beings) is omniscient (following Barrett

[12] Calvin (1559 [1960], book I, chapt. 3) acknowledged that, depending on the environment where one is raised, the *sensus divinitatis* can result in a wide variety of religious beliefs, including idolatry.

et al. 2001), is causally responsible for the design features of our universe (following Kelemen 2004), and takes an interest in our morally relevant actions (e.g., Bering 2011). While such a thin, underspecified theistic concept is often used in philosophical and natural theological discussions, it is hardly the sort of being that theists normally consider, namely one that they form a personal relationship with, such as the God one may get to know when reading the Bible. Indeed, Calvin (1559 [1960]) argued that the *sensus divinitatis* by itself is not enough to guarantee the correctness of religious beliefs, but that divine revelation (Scripture) and the Holy Spirit are necessary complementary sources of knowledge of God. As we have seen, under the Irenaean picture, these supplementary sources are not there to fix a corrupt *sensus divinitatis*, but to enrich and supplement it as part of human spiritual growth. This is a key difference with the traditional Reformed epistemological account (e.g., Plantinga 2000), according to which these complementary sources are necessary to fix a depraved, damaged cognitive system.

If Reformed epistemologists take this Irenaean viewpoint, and regard NES as a form of underspecification, they will have to rethink their notion of sin. Even if the Fall is conceptualized as a Fall from moral innocence, it does not play a discernible role in explaining why human cognitive capacities are sometimes off-track. So while (3) of the Reformed concept of sin (i.e., the view that NES are a result of a historical first sinful act) is not metaphysically incompatible with evolutionary epistemology, it seems strained to maintain it. A more natural reading of the evolutionary and cognitive empirical evidence is that off-track beliefs are results of our evolutionary history.

The question we set out to answer is whether Reformed and evolutionary epistemological notions of proper basicality are compatible. After identifying some points of tension, in particular, the differing conclusions from NES and NEE with regard to religious belief, this paper indicates that Reformed and evolutionary epistemology can be combined into a mixed view that takes CSR and other empirical sciences as a starting point, using a moderate naturalistic framework. Doing so comes at a cost: in the light of current evolutionary and cognitive theories, the Reformed epistemological view of NES is in need of revision. While an empirically-informed Reformed epistemologist can maintain that (1) adult humans actually sin, (2) humans have, from birth, a proneness to sin that they inherit biologically in the light of evolutionary theory and cognitive science, the view that (3) this tendency is caused by a historical Fall is hard to combine with the scientific evidence for an evolutionary and gradual origin of off-track cognitive tendencies, and (4) there is no evidence for epistemic or moral perfection in the earliest humans.

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