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Schleiermacher and the Transmission of Sin: A Biocultural Evolutionary Model

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Abstract: Understanding the pervasiveness of sin is central to Christian theology. The question of why humans are so sinful given an omniscient, omnipotent, and omnibenevolent God presents a challenge and a puzzle. One element of this puzzle is how sinful tendencies transmit in human communities. Here, we investigate Friedrich Schleiermacher's account of sin which we characterize as a biocultural evolutionary approach. That is, we propose that Schleiermacher conceives of sin as both biologically rooted and as culturally transmitted. We look at empirical evidence to support his account and use the cultural Price equation to provide a naturalistic model of the transmission of sin. This model can help us understand how sin can be ubiquitous and unavoidable, even though it is not biologically transmitted, and even if there is no historical Fall that precipitated the tendency to sin.

Keywords: Friedrich Schleiermacher, Biocultural evolution, Original sin, the Fall, Hamartiology.

1. Introduction: The Ubiquity of Sin

In *Orthodoxy* the lay theologian G.K. Chesterton (1909) attempted to defend orthodox Christianity against the Modernists, British theologians at the turn of the previous century who wanted to update Christianity in the light of science. To this purpose, they proposed to discard many orthodox theological concepts, including original sin. As Chesterton (1909, 24) remarked: "Certain new theologians dispute original sin, which is the only part of Christian theology which can really be

proved." He saw sin as an obvious, empirically indisputable feature of human nature, "a fact as practical as potatoes."

We agree with Chesterton that original sin can be empirically grounded. However, doing so requires a re-examination of the underlying ideas and assumptions about what sin is, how it originates, and how it is transmitted. There is no consensus among Christian theologians on these points. As Oliver Crisp (2015) observes, Christian churches (except for the Oriental Orthodox churches)[1] universally accept the Chalcedonian definition of Christ's two natures as human and divine, but there is no such general agreement on sin. Still, sin plays a key role in Christian thinking and practice, particularly because it prompts the need for divine grace and salvation. The fact that humans invariably fall into sin, in spite of an all-powerful, omnibenevolent, and omniscient God (i.e., an omni-God) presents an enduring puzzle to theologians and philosophers of religion. Why do we sin if an omni-God could have easily created human beings who are sinless? Theodicies that appeal to human free will do not, as a primary aim, account for the pervasiveness of sin. They might explain why we sin, but not why it seems impossible to refrain from doing so.

In the absence of a clear Christian consensus on sin, we look at Augustine's account, which is highly influential in western Christianity, as a useful point of reference. According to Augustine and views influenced by him, our tendency to sin (original sin) is due to the Fall. We biologically inherit original sin from our ancestors and pass it on to our descendants. However, the Fall poses theological as well as empirical problems, leading theologians across the centuries to question Augustine's model and to propose models of original sin that do not depend on a historical Fall, and that do not rely on a biological model of the transmission of original sin. In this paper, we examine Friedrich Schleiermacher's account of the transmission of sin as an attractive alternative to the influential Augustinian account. Section 2 gives a brief overview of the doctrine of original sin with a focus on Augustine, and we note why, in spite of recent and older criticisms, it remains influential. Section 3 sketches Schleiermacher's account of sin, which we term "biocultural" due to its reliance on both biological and cultural factors. In section 4, we use the method of science-engaged theology (see e.g., Perry & Leidenhag 2021) to provide an empirical basis of a Schleiermacherian model, and in section 5, we present an evolutionary account for this, grounded in mathematical modelling.

[1] The Oriental Orthodox churches adhere to Miaphysite Christology, which says that Christ has one united nature. This is a form of Trinitarianism that rejects Christ's two natures. Denominations include the Coptic Orthodox Church of Alexandria, the Syriac Orthodox Church of Antioch, and the Armenian Apostolic Church.

2. The Doctrine of Original Sin

"Sin" (and its equivalents, e.g., "hamartia" in New Testament Greek) is a Christian theological concept.[2] A non-religious person might say murder or theft are morally wrong, but not that they are also *sinful*. Theologians argue that such wrongdoings are sinful because they constitute disobeying or not acknowledging God's commandments.[3] The scriptural basis for sin is the Genesis 3 narrative: the first man and woman disobey God by eating from the forbidden fruit from the Tree of Knowledge of Good and Evil. Their transgression not only causes sin to come into the world, but also death, patriarchy, pain in childbirth, agriculture, and an uneasy relationship with snakes. Other scriptural sources, such as letters by Paul and James, provide further clues that sin has a negative impact on human flourishing, freedom, and relationships. For example, we can be enslaved by sin (Romans 6: 16–17), which tarnishes our ability to live in orderly communities (James 3: 16).

Taking scripture as a common starting point, different Christian traditions have outlined diverging conceptions of sin. Augustine (354–430) formulated an account of original sin that is so influential that it is often termed "the doctrine of original sin."[4] The doctrine of original sin is in fact composed of several related doctrines[5] (see Couenhoven 2005 for review). Central is the historicity of the Fall: Augustine proposed that a historical Fall, precipitated by the "primal sin" (or first sin, *in casu*, eating from the Tree of Knowledge of Good and Evil), caused the subsequent sinfulness of all of humanity. One of the many results of the Fall is "original sin" (*peccatum originatum*), the human propensity to inevitably sin. So, the primal sin, together with some mechanism of inheritance, explains why humans are in the state of original sin: because our ancestors committed the first sin, we're all in a state of sinfulness.

According to the Augustinian account, humans were in an original state of righteousness prior to the Fall. This means, among others, that they were *able* to refrain from sinning. By contrast, humans ever since are *unable* to refrain from

[2] We also see terms relating to "sin" in non-Christian traditions, but their meaning is different in each of these cases, so here we focus on the Christian concept.

[3] We will here not discuss the issue of whether divine commandments should be seen in the light of an autonomous or heteronomous morality (for an overview and historical contextualization of this debate, see e.g., Bertini 2017).

[4] The Augustinian account is the focus of some recent edited volumes and special issues (see e.g., Madueme & Reeves 2014, Cavanaugh & Smith 2017, De Cruz & De Smedt 2021, for collections on this topic).

[5] We will here for brevity's sake still refer to this bundle of doctrines as "the doctrine of original sin."

sinning. This is because of far-reaching metaphysical and moral consequences of the Fall, not only for humanity but for the universe as a whole. As a result of the primal sin, original sin is present in all humans, including newborns. It not only instills in them the inevitable propensity to sin (termed "original corruption"), but also the original guilt associated with the first humans.

Augustine developed this account of original sin in part as a response to the British theologian Pelagius (354–418) and his followers, who believed that humans are inclined to sin because they are influenced by a sinful environment, but that, in principle, they could refrain from doing so. Augustine, by contrast, thought sin was unavoidable, and that only God's grace could save humanity. His account of sin is thus closely tied to the necessity of grace, which is why some contemporary authors (e.g., Smith 2017, Green & Morris 2020, Madueme 2021) prefer the Augustinian account, and have defended it over modern alternatives in spite of its lack of fit with modern science. For example, paleoanthropology does not provide any evidence for a historical Fall, original righteousness, or a single ancestral pair for all of humanity (De Cruz & De Smedt 2013, De Smedt & De Cruz 2020).

In the Christian theological literature, there are three proposed mechanisms for the transmission of original sin: biological, federalist, and social. We can see all three in Augustine, but he is mostly associated with the biological transmission model. According to this model, sin is transmitted through sexual reproduction. At the basis of this lie seed principles, an ancient understanding of how reproduction (and other growth processes) work: male seeds are implanted in female wombs, and these male seeds carry the seeds of the next generations, in a Matryoshka doll-like open-ended series. Augustine thought he observed sinful tendencies even in infants, citing this as evidence that we have the tendency to sin inherited from birth: "I have observed and experienced a little one expressing jealousy. Though he was not yet capable of speech, he glared, pale with envy, at his sibling at the breast . . . Surely one cannot call it 'innocence' when a baby prevents his sibling—who is completely dependent for care, and stays alive only because of that one source of sustenance—from having a share in the plentiful, abundant flow of milk" (Augustine, 4th century CE [1961], book I, chapter 11, 21). To Augustine, the phrase from Romans 5:12, that we have all sinned in Adam, should be taken literally: humans all originate from Adam's body and were already physically present there as seeds (Lamoureux 2015).

While the biological model is associated with the doctrine of original sin, we will here briefly note two alternative minority traditions. One is the federalist position, which was developed in Calvinist theology in the 19th century. According to this view, there is no real transferal of properties in the transmission of original

sin from the first pair to their progeny. Rather, God arranges things in such a way that their progeny is treated as if they had sinned and as if they had the first pair's guilt. The federalist position treats Adam as the federal representative of all of humanity, who by sinning has implicated the rest of humanity. This model has to grapple with two monumental problems: the problem of injustice (how is it just that I am guilty of Adam's sin?) and plausibility (why would God arrange the world this way?) (Crisp 2006). Another alternative is that sin is not biologically, but socially transmitted: sin is transmitted through social learning in human communities. Examples of theologians who have developed social accounts of the transmission of sin include Walter Rauschenbusch (1917), Stephen J. Duffy (1988), and more recently, Matthew Croasmun (2017). We will explore Schleiermacher's social model (or more accurately, his biocultural model that contains elements of both the biological and social model) in the next section.

The doctrine of original sin (with the positing of a historical Fall, single couple, original guilt and corruption, and biological transmission of sin) has been influential in western theological traditions, including the major Protestant confessions and much of Protestant theology, as well as in Roman Catholic thought. Its popularity derives from its perceived ability to solve the following dilemma: how can bad things happen if everything is created and willed by an omni-God? Either God created evil, which is problematic, or God didn't, but then we have to postulate an independent evil force (e.g., the devil), which is equally problematic. In Augustine's view, evil in itself is not a causal independent force, like, say, gravity is. Rather, for Augustine, evil is a *deficiency,* the privation of good. This privation expresses itself in humans desiring to do something bad. Since evil is not something that independently exists, humans must be conflicted or mistaken when they desire to do bad things. Thus, Augustine sidestepped the dilemma by claiming that God did not cause sinful inclinations in us, and that there is no independent evil force tempting humanity. His account requires that we posit a change in human nature (pre-Fall to post-Fall): sin changed humanity and the rest of the cosmos so profoundly that there's a discontinuity between our pre- and postlapsarian condition (Pedersen 2020). In this view, because we inherit not only sin but also guilt through biological means, God is not responsible for our tendency to sin, and did not cause it to happen.

The emphasis on a historical Fall by an original human pair has long been a sticking point among theologians. Particularly in recent decades, some theologians and authors in the field of science and religion (e.g., Venema & Knight 2017, Schneider 2012) have rejected the doctrine of original sin because it is not compatible with science. Among many other problems, the current genomic

evidence does not support the existence of a single ancestral human pair, but rather points toward small ancestral breeding populations ranging from a few hundred to a few thousand individuals. There are also enduring theological worries about the transmission not only of sin, but also of guilt. Why would an omni-God create a world in such a way that the sin of the first couple became the sin of all their descendants? This puzzle remains, regardless of whether one accepts the traditional biological transmission of original sin by Augustine, or the Reformed federalist interpretation of original sin. As the Reformed theologian Benno van den Toren (2016, 13) wonders, "How can a just God attribute the sin of the first couple to all their offspring?" For this reason, some theologians have formulated revised versions of the doctrine of original sin, such as Crisp's (2015) moderate Reformed doctrine of original sin, which denies the transmission of guilt along with sin. Thus, on scientific and theological grounds we have reasons to re-evaluate the doctrine of original sin.

3. Schleiermacher's Biocultural Account of the Transmission of Sin

Social accounts of the transmission of sin present an attractive alternative to the doctrine of original sin. They do not require a historical Fall which may make them more easily compatible with scientific accounts of human origins. They have early roots in Paul's Letter to the Romans, which describes sin as an emergent property that originates from individual sinful acts. Paul posits a choice: we can either be part of a *body of sin* (the community of sinners) or of the *body of Christ*, the church (e.g., 1 Cor 12, Rom 6). Paul's concept of "body" as a metaphor for a community of people is inspired by Stoic philosophy. Stoicism was a philosophical tradition that permeated the culture at the time; recall that Paul and Seneca were contemporaries. For Stoics, the only things capable of acting are bodies (*soma*), so if we are affected by something, be it our emotions or social forces, they must constitute a body too. Sin, in order to affect us, must therefore be a body. In Paul's view, we are part of a social body of sin, which means that we participate in the communal practices that jointly constitute sin (Croasmun 2017, 112–113). In Paul's writings, the body of sin gets an almost agential character. Sin is a slave master, which controls humans (Rom 6:6), rules our bodies by directing our passions (Rom 6:12), and uses our body parts as instruments (Rom 6:13). Paul's account of sin seeks to emphasize that everyone needs salvation: the pull of sin is so powerful that we cannot free ourselves from it (Green 2017).

However, Paul does not outline a mechanism of how sin would work as a social agential force. One such detailed proposal was drawn up by the Prussian

theologian Friedrich Schleiermacher (1768–1834), who developed an intriguing alternative to the doctrine of original sin. As we'll see below, Schleiermacher pays attention to both biological and cultural elements of original sin, which makes his model an excellent candidate for an empirically-informed account of sin. We focus on the presentation of his ideas in his monumental dogmatic theology, *Christian Faith* (*Der Christliche Glaube,* CG, 1830 [2016]), which aimed to put dogmatic theology on firm grounds, fitting it within the larger Enlightenment project of critically analyzing traditional theological concepts in the light of the latest philosophy and science.

The most eye-catching feature of Schleiermacher's account is that does not invoke a historical Fall. He rejected the Fall as well as the fundamental "alteration of human nature that has arisen by means of a first sin committed by the first human beings" (CG §72, 442).[6] While some contemporary theologians formulate non-lapsarian views because the Fall is not easily reconciled with evolutionary theory, paleoanthropology, and other scientific disciplines, Schleiermacher's primary concern was theological. He believed that the Augustinian doctrine of original sin, with its emphasis on a historical Fall, makes no theological sense. Original sin explains why we currently tend to sin, but it doesn't explain why the first humans did. Augustine did not appeal to innocence or gullibility (as some other early Church Fathers did, such as Irenaeus), so the first pair sinned knowingly: given their original righteousness, their capacities for reason were not clouded by original sin, as Schleiermacher emphasized. They went in clear-eyed, making their mistake all the more puzzling. It is more parsimonious to say that the tendency to sin is part of human nature all along. Schleiermacher explicitly appropriated original sin as a part of our psychological makeup, "a susceptibility imparted to every individual" (CG §70, 419; Wyman 1994, 233–234). Thus, we no longer need to posit a large cognitive difference between humanity pre- and post-Fall. Rather, in Schleiermacher's view, each person falls individually.

Without a historical Fall, Schleiermacher still has to explain why we all seem to be in this condition of fallenness (CG, §71). If not through a historical event, why are we this way? Not positing a Fall has the risk of assuming that humans would, in principle, be able to escape the condition of fallenness. That would make grace redundant, a Pelagian position that is theologically unorthodox. Schleiermacher wanted to keep the necessity of grace. He explained how we can have solidarity in sin without a Fall by conceptualizing sin as part of human nature. He aimed to

[6] We refer to the paragraph in *Christian Faith*; the page number refers to the 2016 translation by Tice et al.

solve a paradox: the sins we commit do not originate in us, yet they are something we are fully responsible for. His explanation contains three components: God-consciousness and our falling from it, psychological tendencies rooted in our biology that cause us to sin (the seed of sin), and the cultural transmission of sin in social contexts. Because Schleiermacher invokes both biological features and cultural transmission, his account can be characterized as "biocultural." We use this term rather than more common alternatives in the recent literature such as "gene-cultural coevolution" or "dual inheritance model" because it is more general, and avoids the anachronism of an early nineteenth-century publication that talks about genes. Moreover, "biocultural" points to two kinds of factors that Schleiermacher would have been familiar with: biology and culture that interact with each other.

God-consciousness constitutes the biological component of Schleiermacher's account of sin. It is central to his dogmatic theology and ethics. It is a thick theological concept that includes our reflective awareness of the self ("self-consciousness"), awareness of how one is socially situated ("species-consciousness"), and a feeling of absolute dependence on God. Elaborating on earlier work where he argued that religion originates in feeling (e.g., Schleiermacher 1799 [2006]), *Christian faith* examines what this feeling consists of, and how it originates. God-consciousness arises as a spontaneous product of our creaturely, biological nature. It starts out as a feeling of being dependent on other creatures, which arises from the push and pull of us acting on the world and the world acting on us—which Schleiermacher terms "relative dependence." We are always dependent on our environment to sustain ourselves. We are enmeshed in a web of interdependence: the air we breathe, the soil we stand on, the creatures we eat, the humans we collaborate with.

Once we become aware that there is a Being that underlies this whole, we become aware that God "is designated as the one grounding this interconnected being in all its diverse parts" (CG, § 30.1, 183). This awareness is God-consciousness. It is a kind of self-transcendent sense where we realize our absolute dependence on God. Importantly, when we reach this stage (evolutionary and developmentally), earlier forms of consciousness do not fall away. Nor are they necessarily bad: they are necessary to secure our basic means of existence (we need to eat, associate with other people, etc.) and God-consciousness builds on our creaturely awareness of our surroundings. Yet, it is in the mismatch of God-consciousness and the lower forms of consciousness that Schleiermacher locates sin. Sin is an inability to integrate our religious self-consciousness with our social and bodily self-consciousness (Nelson 2009). Because we are so caught up with our

lives—we're happy to eat and to be with friends, we're sad when a loved one gets ill or dies—we fail to see that God made a good world. Our sensuous nature makes us lose sight of the fact that everything God created is for the good. This tends to obscure the fact that we are absolutely dependent on God.

God-consciousness is crucial for Schleiermacher's account of sin, because without being aware of the good, we would not sin, "sin exists only insofar as a consciousness of sin also exists" (CG §68, 410). God-consciousness only appears in humans, and is not present in other animals. Thus, only when humans become God-conscious are they able to sin. To this end, Schleiermacher sketches a proto-evolutionary account. Although *Christian Faith* was published some three decades before Darwin's *On the origin of species* (1859), evolutionary ideas (at the time called *transmutationism*) circulated widely, and Schleiermacher had access to these. Most pertinent to his cultural sphere was the work by Gottfried Reinhold Treviranus, notably his *Biologie, oder Philosophie der lebenden Natur für Naturforscher und Aerzte* (*Biology, or philosophy of living nature for naturalists and physicians*), which was published in Göttingen in 1802. This work went through six editions from 1802 to 1822; it was highly influential, and made the term "biology" the standard term to refer to the study of living things (previously, it was "natural history"). Treviranus presented a transmutationist theory, based on fossil evidence. Moreover, he portrayed nature as a web of interdependent beings, an idea that recurs in Schleiermacher's work (De Cruz 2022).

Daniel Pedersen (2017: 35–39) argues that Schleiermacher knew about, and accepted transmutationism. A key passage in *Christian Faith* is the following: "we pretty much know, regarding our world that species have existed that are no longer present and that present species have not always existed" (CG §46 (postscript), 254). The only biological theory at the time that incorporated species going in and out of existence was transmutationism. Moreover, §5.1 presents an explicitly transmutationist idea about human origins, where Schleiermacher connects human cognition to that of extant non-human animals:

> Suppose that we go back to the initial, more obscure period of the life of human beings. Everywhere therein we would then find the animalistic life to be almost alone predominant, but the spiritual life would be still entirely suppressed. As a result, moreover, we would have to imagine the state of a human being's consciousness in that obscure period to be very much akin to that of the lower animals. (CG, §5.1, 28)

Without God-consciousness, what we term "sin" would only be a "self-focused activity of flesh" (CG §67, 405), such as gluttony and lust, which originate prior to the emergence of God-consciousness:

> If God-consciousness has not yet developed, there is also not yet any resistance to it ... in the future this self-focused activity of flesh will indeed become resistance to spirit [i.e., sin], but beforehand it cannot actually be observed as sin, but only as a seed of sin at best. (CG §67, 405)

Here, Schleiermacher hints at the tendencies in our biological makeup that in other animals would not be called sin but "seed of sin," such as, for example, lust for power or violence against conspecifics. We inherited this seed of sin from our hominin ancestors. Only when humans became God-conscious, these inclinations could become actual sin. As Derek Nelson (2009, 136) puts it, our biologically inherited sensible self-consciousness is sometimes out of sync with God-consciousness. As a side-effect of how creation works, "God-consciousness outpaces, at times, the gait of the sensible self-conscious will." God-consciousness arises both in individuals and in social structures (communities), which will lead us to the social model below. The puzzle then arises why humans individually ignore their God-consciousness, and sin as a result of this. Since Schleiermacher explicitly denies a historical Fall, and therefore denies that human nature was fundamentally altered, he cannot invoke a biological tendency to sin that resulted from whatever might have happened during or right after the Fall.

To solve this puzzle of why humans sin, Schleiermacher appeals both to our biological makeup and to cultural transmission. Our biological makeup gives us God-consciousness so we have an awareness of the good. When our animal self-consciousness and our God-consciousness don't align, we sin. This happens because we are born in cultures that have plenty of sin. We can learn to express our morality fully in our cultural communities, but this is also where sinful tendencies are transmitted. To make an imperfect modern analogy: we may have genes that code for violent behaviour, which we share with our closest living relatives, the chimpanzees. Some human communities are more or less pacifist and do not allow for public expressions of violent behavior (e.g., the Amazonian Pirahã, the Semai of Malaysia). In these communities, the particular seed of sin that one might call ancestral violence is not transmitted. In other communities (e.g., the historical states of Prussia and Sparta), violence is publicly condoned, encouraged, and thus culturally transmitted.

This raises the question of why similar sinful tendencies (e.g., stealing, violence, xenophobia) arise in human cultures. The reason for this is our biological tendencies, namely our (biologically situated) God-consciousness, and the "seeds of sin" which are also biological and which make us more susceptible to some cultural influences than others, as we will show below. Humans are born into faulty communities with sinful ways of engagement, "the sin of each individual has its source in an earlier existence above and beyond one's own existence" (CG §69, 414). We inevitably pick up some of these ways of engaging within our communities through growing up in a culture where we learn the norms as children, and thus we sin: "any given mode of education is grounded in leanings and experiences that have preceded the existence of the one who is to be educated" (CG §69, 414).

Schleiermacher's social transmission account aims to resolve the tension of sin as something that is unavoidable—part of our evolved human nature and part of human cultures—and also as something we are personally responsible for. We exert some degree of control over the cultural ideas we inherit. For example, across cultures we can find various implicit biases, such as negative attitudes toward people of different ethnic groups, genders, or social classes. Even if one is aware of such biases and tries to withstand them, one will still often fall foul of them (see Vicens 2018 for a conceptualization of implicit bias as sin). Because cultural transmission is such a powerful force in shaping human behavior, we will inevitably end up adopting some socially transmitted sinful dispositions, such as the endemic racism in the United States.

How does this social transmission of sin relate to original sin? Note that while Schleiermacher locates sin in social processes, he does not think they ultimately originate there. Rather, sin originates in our innate sense of the good (tied to God-consciousness), that we deliberately, and each individually, fall from. Because we are members of cultural communities that are imbued with sinful inclinations and behaviors, we will tend to fall and sin (CG §72). Thus, we each fall *individually* by denying our God-consciousness.

The social transmission of sin can be seen in a larger cultural evolutionary framework, where humans are born in sinful communities. We acquire these sinful behaviors through social learning, and thereby set up the conditions for our descendants to inherit them: "What appears from birth as the susceptibility to sin of a generation is conditioned by the susceptibility to sin of earlier generations and itself conditions the susceptibility to sin of generations yet to come" (CG §71, 429). We are all implicated in sin, not only because of the actual sins we commit, but also because we transmit sinful beliefs and behaviors, and expose others to them, not

only young children but also fellow adult citizens. In this way, Schleiermacher repudiates the Augustinian notion of original guilt: we are not guilty of a sin that our ancestors committed (CG §72, 447). At the same time, we are responsible for the sins we commit and help perpetuate, even though they may not have originated in us.

Since human nature was not fundamentally altered through a historical Fall (as Augustine claimed), Schleiermacher's biocultural account of sin locates the origin of evil with God. After all, sin is a result of our biological makeup and social environment. Individual transmission of sin is a result of how God created us. As Pedersen (2020, 142) points out, this account "makes God the author of sin and the cause of evil. Indeed, Schleiermacher does not merely imply this, but explicitly claims it as a consequence of his account."

Like Augustine, Schleiermacher sees sin as a privation of good, not as an independent quality. However, he does see God-consciousness as something that is fully part of human nature. We don't just transmit sin, but also virtues socially. We use reason to discover ethical principles, and we participate in social life where we overcome our individual limitations through sharing, collaboration, and forming communities: we can flourish and morally improve by participating in human pursuits, including science, religion, politics, and the arts. Notably, Schleiermacher thought that we could fully realize ourselves in a plurality of communities and institutions (Schleiermacher 1812–1813 [2002], §61, §97). In our human-made institutions we can bring our lives closer to our moral ideals. Living in these interdependent communities, and using our reason and our innate sense of the good we can devise moral norms, which we can then choose to follow, or not to follow. This discovery of moral norms through reason is the flip side of the social transmission of sin. Sin is the social transmission of the denial of God-consciousness, as we saw above. Virtue is an acknowledgment of God-consciousness, and is equally socially transmitted.

Schleiermacher's account is still relevant for discussion on the naturalistic origins of sin because it acknowledges both biological tendencies (God-consciousness and the seed of sin) and cultural factors in the transmission of sin. Given recent work on the importance of both biology and culture in the transmission of moral norms and behavior (as we will review below), we can reassess his theory in the light of contemporary empirical evidence.

4. Evaluating Schleiermacher's Biocultural Account of the Transmission of Sin

If we assume, as Chesterton (1909, 24) did, that empirical evidence is relevant for accounts of the transmission of sin, what kind of evidence would be germane? John Perry and Johanna Leidenhag (2021) use the term "science-engaged theology" to denote a method which aims to solve specific puzzles that arise on the intersection of science and religion. Rather than asking if Christianity (or religion) as a whole can be reconciled with modern science, it is more productive to ask if a specific theological question can be answered using the tools of a specific scientific (sub)discipline. In our case, when we consider the transmission of sin, we should ask which scientific disciplines might be relevant.

At the turn of the previous century, when modernist theologians such as Frederick Tennant (1866–1957) considered the question of sin, e.g., in *The origin and propagation of sin* (1902) and *The sources of the doctrines of the Fall and original sin* (1903), the focus was on biology, specifically on evolutionary theory. At the time, some forms of evolutionary theory were generally accepted by the scientific community, and the animal ancestry of humanity was beyond reasonable scientific dispute. The many successes of evolutionary theory, finds of early human fossils (Darwin 1871), striking similarities between human and primate anatomy (e.g., Huxley 1863), and between human and primate facial expressions and emotions (Darwin 1872) led modernist theologians and church leaders to re-evaluate Christian theological concepts such as original sin. An example of the spirit of the times were the sermons on evolution (dubbed "Gorilla sermons" by the British press) by the Anglican bishop Ernest Barnes in the 1920s and 1930s. In these, he denied the Fall and original sin, as concepts that were both outdated and not in line with the sciences (Bowler 2007). By contrast, Tennant (1902) sought to salvage some elements of the doctrine of original sin. He recognized humans have an (apparently) inescapable tendency to sin, and attributed this to our animal ancestry. In his view, we inherit our tendencies for self-preservation from our primate ancestors; these inclinations only become sinful once we become morally aware. Rather than falling down, we fall up. But as we become morally aware, we fail to live up to the potential that we have as moral agents. The contemporary theologian Patricia Williams (2001) defends a similar biological model.

While biological evolution is certainly relevant for the theological puzzle-solving of original sin, we will cast a wider net. There is an increasing recognition that cultural practices have a large influence on human behavior. Biology and culture are intertwined throughout prehistory and history—a phenomenon variously referred to as gene-culture co-evolution or dual inheritance. Cumulative

culture explains the demographic success of humans, able to colonize every landmass (Dean et al. 2014). We cannot explain how humans behave by genes (and genetic evolution) alone. We need models of cultural transmission to understand differences between human communities and to explain recurrent patterns of human behavior (Richerson and Boyd 2005; Henrich 2018). In the light of this, we will now evaluate two aspects of Schleiermacher's account: the emergence of God-consciousness and the social transmission of sin.

4.1. Empirical Evidence for the Emergence of Sin Through God-Consciousness

As we have seen, Schleiermacher proposes that sin can only occur when we have some form of moral awareness, which he situates in his thick theological concept of God-consciousness. What would constitute empirical evidence for God-consciousness? After all, it is a theological, not a scientific concept. However, for science-engaged theology it suffices to explore scientific concepts and empirical findings that shed light on, and are compatible with the theological idea of God-consciousness. It does not require full scientific proofs of theological concepts, because these are impossible. Recall that Schleiermacher saw God-consciousness as part of human nature, and as something that arose in the course of human evolution. We can ask when beliefs in gods arose, as this sets up the necessary conditions for sin to arise (no sin without God-consciousness).

Schleiermacher links religion and morality in his concept of God-consciousness. Across cultures, people perceive a relationship between religious beliefs and morality. In the cognitive science of religion, there are several hypotheses that aim to explain this relationship. The *supernatural punishment hypothesis* (SPH) states that the threat of punishment by supernatural agents inhibits self-interested behavior and promotes cooperation. Supernatural agents, such as ancestors, place spirits, gods, and ghosts tend to have privileged knowledge of human affairs, often coupled with extraordinary capacities such as controlling the weather (White et al. 2022). Because of their perceived special properties, humans fear supernatural punishment, for example, through their control of the weather supernatural agents can initiate a drought to punish misbehaving people. This leads them to behave better even if no-one is watching, even when there are no secular punishment systems in place.

One specific version of the SPH is the Big Gods hypothesis, developed by Ara Norenzayan (2013). Big Gods are a special category of supernatural beings: they are omniscient (or at the very least, very knowledgeable), powerful (very often they have created the universe), next to moralistic and punitive. A clear example is

the Abrahamic god, but Big Gods can be found outside of the Abrahamic traditions, for example, in many strands of Hinduism. Norenzayan (2013), noticing a strong correlation between belief in Big Gods and large-scale societies, proposes that it is thanks to belief in such gods that humans were able to associate in larger groups, giving rise to large-scale societies. In small-scale societies humans exert social control through reciprocity, shunning, and other mechanisms. In large-scale societies this is no longer possible, because we no longer know all the members of our group personally. According to Norenzayan, people fearing that god (or the gods) are watching them and would punish them, behave more cooperatively. He identifies Göbekli Tepe as an early testimony to Big God beliefs. This site with a probably religious function was built by hunter-gatherers in present-day Turkey dating to about 11,500 Before Present. It consists of massive stone pillars arranged in circles and carved with animal imagery.

Norenzayan holds that Big God beliefs precede the emergence of large-scale societies. However, the question of what came first is an enduring topic of lively debate among cognitive scientists of religion. Harvey Whitehouse and colleagues (2021) argue that belief in Big Gods only arose after large-scale societies became established. However, their paper (originally published in *Nature*) had to be retracted due to errors in their analysis.[7] In any case, the Big Gods account predicts a late origin of God-consciousness.

An alternative version of the SPH is *broad supernatural punishment* (Watts et al. 2015): across cultures, there is a broad range of supernatural beings, including localized spirits, but also non-agentive forces such as karma. These supernatural entities can also inflict punishment for moral reasons, thereby facilitating cooperation and reducing cheating in human societies. A third alternative (Purzycki et al. 2022) is the *moralization bias.* Humans conceptualize other humans as interested in moral behavior. Since we use the same cognitive apparatus when we represent the minds of gods and those of humans, humans represent the minds of supernatural agents similar to human minds. Because of this, supernatural agents are perceived as also being interested in moral behavior (moralization bias). Purzycki et al. (2022) recruited participants from 15 different cultures. They

[7] The main problems with Whitehouse et al.'s paper concern the quality of the dataset (Seshat: Global History Databank) on which the analysis is based. Due to serious issues with the coding of the dataset (sloppiness, mistakes, and omissions), their paper had to be withdrawn. However, the authors subsequently cleaned up the dataset and rewrote the paper. They insist that their conclusions still hold. A new version of the paper (not published yet at the time of writing) can be found here: https://osf.io/mbnvg/

concluded that the moralization bias is widespread across cultures. It did not matter whether their participants believed in Big Gods (e.g., Shiva, the Christian God) or less powerful supernatural agents such as forest spirits. The participants in this study also associated supernatural beings who were morally concerned with members of their community cooperating more and cheating less.

The latter two hypotheses allow us to potentially push back in time the origins of God-consciousness, though it is difficult to pinpoint archaeologically when it would have emerged. Strong archeological clues for religious beliefs emerge during the Late Pleistocene, particularly in the form of symbolic artifacts, usually consisting of a mix of human and animal body parts. The oldest depictions of such therianthropes date from 43,900 Before Present. They are part of an elaborate rock art panel that depicts therianthropes hunting wild pigs and dwarf bovids, from Sulawesi, Indonesia (Aubert et al. 2019). The oldest figurine depicting a therianthrope is the so-called lion-man, a mammoth ivory figurine with a human body and a cave lion's head, dated to about 39–41,000 Before Present. It was found in Hohlenstein Stadel cave (Southwestern Germany), and stands at about 31 cm (Kind et al. 2014). Some authors (e.g., Lewis-Williams 2002) have argued that patterns painted on cave walls and on some mobiliary art, such as hand stencils and collections of dots, are evidence of altered states of consciousness and shamanic practices. The oldest hand stencil is 39,900 years old and was discovered in Sulawesi, Indonesia (Aubert et al. 2014). This archaeological evidence may point toward belief in supernatural beings. This allows us to put the emergence of God-consciousness at about 44,000 Before Present.

4.2 Empirical Evidence for the Social Transmission of Sin

We will now examine Schleiermacher's social transmission of sin by looking at evidence for social learning in humans. Growing empirical evidence suggests that children acquire cultural (including moral) norms through social learning. Toddlers show "promiscuous normativity," i.e., they can infer from a single instant of how something is done a norm of how it *ought* to be done. This is not just about moral norms, but about any cultural norms, for example, dress code or how to play a game (see e.g., Schmidt et al. 2012). They also enforce social norms on other group members.

Children aged four to six react with disapproval toward people who do not conform to the norms of their community, even if these are merely invented communities for the purposes of a psychological experiment. For example, Roberts et al. (2017) show that American young children disapprove of members of

communities that have been made up ad hoc in a lab that do not adhere to arbitrary norms, such as eating one particular kind of berry rather than another. This tendency declines in older children and disappears in adults. A replication of this experiment in China (Roberts et al. 2018) shows that the tendency to disapprove of norm violations is present in both Chinese children and adults.

Young children are also directly influenced by the behaviors of their peers or parents, for example, both US and Indian children share less after witnessing their parents being stingy (Blake et al. 2016). This research indicates that young children are to an important extent guided by the norms of their community and the behavior of their elders when deciding how to behave. Throughout human evolution, we see the supreme importance of cultural transmission in various hominin species. Stone tool technology, even Oldowan, the simplest one, requires a level of social learning not seen in extant nonhuman primates, presumably involving processes such as explicit teaching and imitation (Morgan et al. 2015). Unfortunately, moral norms are not preserved in the archaeological record, but it is plausible that the transmission of such norms was also cultural in the distant past. Over time, this cultural transmission of norms, which may have involved diverse domains (e.g., prohibitions on incest, obligations to care for group members) could have effects on human genes as well, as they favor the selection of altruistic behavior. Groups with altruistic behavior would do better than groups without it, leading to a cultural group selection of norm-governed moral behavior (see e.g., Tomasello 2016).

If sin is transmitted socially, as Schleiermacher and other adherents of the social model argue, then behaviors we morally disapprove of can be transmitted socially and this is what the empirical record shows. A growing body of empirical evidence suggests that people are very sensitive to their social environment and to the perceived social approval or disapproval of their behaviors. Actions such as bullying or harassment are not socially learnt, rather, people who bully and harass look for social cues to gauge to what extent their behavior is socially sanctioned. In a series of studies on bullying in secondary schools in the US, Betsy Paluck and co-authors (2016) enrolled students who were well-liked by their peers to take part in anti-conflict interventions. These popular students were asked to become the public face of opposition to bullying, and to spread anti-bullying messages among their peers. As a result of their intervention, reports of bullying incidents declined by 30% at these schools. Students were apparently less willing to bully when they perceived that popular peers found it unacceptable. Munger (2016) used a Twitter study with bots that automatically responded to white users who employed racial slurs with the following message “Hey man, just remember that there are real

people who are hurt when you harass them with that kind of language." Targeted users reduced racial slurs for up to a month after this intervention, but only if the bot was presented as a white man (i.e., a perceived ingroup member) and especially if the bot had a high number of followers (i.e., was perceived as socially influential). Blanchard et al. (1994) conducted a similar study in a live setting on campus where students who heard someone condemning racism expressed stronger anti-racist sentiments, whereas those who heard racism condoned expressed weaker anti-racist views.

Moreover, several studies have probed the uptick of hate crimes following two election results in the US and the UK in 2016: the US presidential election and the Brexit referendum in the UK. Hate crimes included spikes in intimidation, harassment, property damage, and hate speech against foreigners, Muslims, disabled and LGBTQ+ people (see e.g., Devine 2021). Both political campaigns significantly used negative rhetoric against aforementioned minority groups. Paluck and Chwe (2017, 990) contend that this increase in hate crimes is not because perpetrators "learn" xenophobia, Islamophobia, etc. from the media or the political candidates, but rather that "potential perpetrators are encouraged to act by the fact that Trump garnered votes and now holds the highest office. They infer from this that they have a better chance of escaping social and legal sanction than before his election." Similarly, in the UK the perpetrators of hate crimes felt supported by the rhetoric from the government and popular press and media that stigmatized entire communities, such as vans hired by the Home Office exhorting illegal immigrants to go home or face deportation (Burnett 2017).

Taken together, the developmental psychological and sociological evidence points to the social transmission of sinful tendencies and behaviors within communities. As Schleiermacher already argued, as a child you are born in a community with sinful tendencies and behaviors that you absorb and that you will inevitably perpetuate and transmit to younger community members. The psychological and sociological evidence is compatible with Schleiermacher's model of the transmission of sin, and can illuminate it.

5. A Cultural Evolutionary Model for the Social Transmission of Sin

To get a sense of the evolution of cultural or moral norms within communities, we can use mathematical modelling. Though presently not often considered in empirically-informed theology, this can be a fruitful source for science-engaged theology. We can model the social transmission of sin using the cultural Price equation. The Price equation is devoid of any specific content, so it can be flexibly

used to model changes over time in traits that are inherited through cultural or genetic evolution, or a combination of both. In the cultural Price equation (El Mouden et al. 2014), cultural change is modeled as a result of cultural fitness. Certain cultural traits are adopted or not adopted by group members, and as a result their distribution in the population changes over time. To take an example, roller skating was at some point popular in the US and western Europe, and had then a high cultural fitness, but it subsequently got out of fashion, and now has a lower cultural fitness.

The cultural Price equation looks at the change of a cultural trait measured at a population level, denoted by $\Delta\bar{z}$, as shown in equation (1).

$$(1) \qquad \Delta\bar{z} = Cov(c,z) + E_c(\Delta z)$$

$\Delta\bar{z}$ is the change of a given cultural trait from one generation to the next, for example, roller skating, the wearing of hats, or religious attendance—the cultural trait is denoted with z. For our present purposes, $\Delta\bar{z}$ denotes changes in the degree to which a given hominin population conforms to specific moral norms. We assume here that hominins who are members of this community are aware of their moral norms, and attempt, in various degrees, to live up to them. People who succeed better at adhering to these norms have higher *z*-values, whereas those who do less well have lower *z*-values. The differential success between these individuals will influence the average value of *z* over time.

To calculate $\Delta\bar{z}$, the cultural Price equation adds up two terms, the first, $Cov(c,z)$ is the component that is concerned with selection, the second $E_c(\Delta z)$ is the component that looks at systematic biases that might influence or distort the selection process (Okasha 2006, 26–28). $Cov(c,z)$ indicates the co-variance of individual *z*-values and their relative cultural fitness *c*, which denotes the number of cultural descendants of particular individuals in the next generation, divided by the population mean number of cultural descendants. For example, suppose that Lucy who roller skates can get three other people to do it, and the mean number of cultural descendants for this trait is 2, then Lucy's relative fitness is 3/2, which is a higher than average cultural fitness. $E_c(\Delta z)$ is the expected cultural fitness-weighted change in prevalence of *z* over time, averaged in the population. For another example, take Ben who can convince his neighbor to also volunteer in the local soup kitchen. If the mean number of cultural descendants for this helping behavior is 2, then Ben's relative fitness is 1/2, which is a lower than average cultural fitness.

In genetic evolution this is assumed to be zero, because random mutations do not lead genetically-coded traits to systematically differ from parents to offspring (in other words, there will be changes but these will not be directional). But in cultural evolution this term is not negligible, as there are systematic distorting influences on how individuals absorb culturally transmitted information. For example, the ideal that all people are equal is often distorted by racist, classist, and gender biases, with as a result that some people are more equal than others. Okasha (2006, 28) reformulates the Price equation to get a better grasp on what $E_c(\Delta z)$ is as follows:

$$(2) \qquad E_c(\Delta z) = E(\Delta z) + Cov\ (c, \Delta z)$$

The first term on the right side of equation (2) represents individual distorting biases, also called cognitive attractors. These are tendencies of human minds to systematically distort culturally transmitted information, to selectively remember or misremember. For example, a cultural trait that is difficult to keep in memory or that is very hard to do without extensive practice will have more limited cultural success, simply by virtue of human cognitive limitations: fewer people are able to play *La cathédrale engloutie* by Claude Debussy (1910), than they are capable of playing *Chopsticks* (A. de Lulli, 1877), a simple waltz enthusiastically hammered out by piano novices across the world. The human mind not only distorts due to limitations in memory or ability, but also in the kinds of things that our minds respond well to. For example, some culturally transmitted concepts such as zombies or vampires (dead people who are somehow still alive) are counterintuitive, and therefore surprising and arresting, making them good candidates for cultural transmission (Boyer 2001). In the moral domain, moral ideas that accord well with our intuitive ideas about justice, fairness, and not doing harm are also more likely to spread culturally, hence the cross-cultural independent invention of the golden rule, do not do onto others what you don't want done to you (see Flanagan 2017 for an exploration of moral foundations and their role in the cultural evolution of moral norms). On the other hand, we also have evolved biases that dispose us to sinful cultural traits, which Schleiermacher referred to as "seed of sin." Social factors will either facilitate or impede these biases. For example, recently far-right ideologies thrive due to social contagion (Youngblood 2020). They are facilitated by evolved cognitive biases such as wariness of outgroup members, tendencies of men to dominate women, and identifying violence with courage.

The second term in equation (2) is of particular relevance to our present discussion, as it can potentially capture the cultural transmission of sin. Note that $Cov(c,\Delta z)$ is subtly different from cultural selection (recall, that is $Cov(c,z)$). Here, what is modeled is the extent to which people will adopt or abandon cultural traits based on the influence of group members who display such traits, i.e., the perceived cultural prevalence of the traits. The most common ways in which this happens is conformist bias and prestige bias. In conformist bias, people will uncritically accept certain cultural practices if they are perceived as ubiquitous. Prestige bias is adopting certain traits because influential or successful people practice them. In the previous section we have seen empirical evidence for conformist and prestige bias in the adoption of moral norms (e.g., do no bully) or certain problematic behaviors (e.g., hate crimes). Both of these biases are at work in the transmission of sin, or in resisting it. As we saw, high-status individuals (in high school, or on Twitter) have a large impact on reducing problematic behavior such as bullying and using racist slurs.

The cultural Price equation (1) predicts that the proportion of z will continue to change over time as long as there is covariance between the cultural fitness of individuals and the extent to which they possess z (their individual z-values). To go back to roller skating, as long as enthusiastic, skilled skaters are more likely to get others to take up the sport, the proportion of roller skaters in the population will change over time. Likewise, people who are moral exemplars will have more cultural descendants. For example, Confucius was and still is perceived as a moral exemplar by many East Asians, leading his specific moral ideas (Confucianism, also called Ruism) to be widespread across East Asia, and recently also in the west (Olberding 2011). To take another example, in contemporary hunter-gatherer cultures, generous hunters who share their spoils are more socially influential, and more likely to enjoy the altruism of others, compared to less generous hunters (Bird & Power 2015). As long as some people have more moral influence than others, or there is some form of covariance between a person's moral standing and her ability to influence cultural descendants, the moral views within a population (whether for good or ill) will be subject to change.

But the expected fitness change in a population based on factors other than cultural selection, $E_c(\Delta z)$, also plays a crucial role in equation (1). It includes both people's following of lower moral standards due to the perceived influence of prestigious individuals (e.g., indulging in drugs because famous musicians do it), but also due to a perceived prevalence (e.g., thinking it is OK to dodge one's taxes or be racist because "everyone does it"). However, this term also includes individual innovation, which changes the original information, but can lead to an

improvement just as much as a deterioration of the original culturally transmitted information. As an example for the good, take the arguments against slavery and against the trade in fellow humans by abolitionists such as John Wesley (1703–1791) and William Wilberforce (1759–1833). At the time, this was a cultural innovation as many people thought slavery (or at the very least the trade in slaves) was economically and morally acceptable. This accords with Schleiermacher's ideas that humans are able to resist at least some sinful tendencies (in this case, greed, racism, and dehumanization) and that they are able to leave a better legacy for future generations.

The cultural Price equation captures mathematically how the transmission of moral norms is the result of individual and collective biases and of individual innovation. As modeled here, cultural fitness is independent of genetic fitness. It is possible for someone to have great cultural fitness, i.e., many cultural descendants, but only a modest genetic inclusive influence, e.g., no genetic children. For example, Mother Teresa has enduring cultural influence and offspring in the Missionaries of Charity, a religious congregation she founded in 1950, while having no genetic descendants. However, gene-culture co-evolutionary theories predict that changes over time in z can lead to different selective pressures at the genetic level. To get a full picture of how this gene-culture co-evolution would work goes beyond the scope of this paper, and beyond the simple mathematical model outlined above. However, we have shown with this model how contemporary mathematical approaches to cultural evolution can illuminate theological ideas, viz. the transmission of sin.

6. Conclusion

In this paper, we have reviewed Friedrich Schleiermacher's biocultural model of the transmission of sin. We have shown through a science-engaged theological approach how diverse bodies of empirical evidence from a range of disciplines, notably social psychology, cognitive science of religion, and mathematical modelling, can be used to evaluate Schleiermacher's approach. From this we show that his attention to both the biological propensities of humans and their attunement to cultural norms provides a compelling explanatory framework for the transmission of sin. With this paper, we have shown that an alternative Schleiermacherian model of the transmission of sin can be empirically grounded, using a science-engaged theological approach.

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