

God's Punishment and Public Goods

A Test of the Supernatural Punishment Hypothesis in 186 World Cultures

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Cooperation towards public goods relies on credible threats of punishment to deter cheats. However, punishing is costly, so it remains unclear who incurred the costs of enforcement in our evolutionary past. Theoretical work suggests that human cooperation may be promoted if people believe in *supernatural* punishment for moral transgressions. This theory is supported by new work in cognitive psychology and by anecdotal ethnographic evidence, but formal quantitative tests remain to be done. Using data from 186 societies around the globe, I test whether the likelihood of supernatural punishment—indexed by the importance of moralizing “high gods”—is associated with cooperation.

KEY WORDS: Cooperation; Evolution of cooperation; Gods; High gods; Intentionality system; Religion; Sanctions; Standard Cross-Cultural Sample; Supernatural punishment; World cultures

*Suspicion always haunts the guilty mind;
The thief doth fear each bush an officer.*
—Shakespeare, *Henry VI*, Part 3

*From the study of past religions, primitive and developed, we shall gain
the conviction . . . that every religion implies some reward of virtue and
the punishment of sin.*

—Bronislaw Malinowski (1935:viii)

Cooperation is difficult to achieve among self-interested individuals. Sometimes there are mutual advantages making even the most selfish prefer to cooperate

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(that is, when personal gains will exceed the costs of cooperation). However, many cooperative pursuits in human social life are fragile because free riders can exploit the benefits of public goods that others have contributed to achieving, without incurring any of its costs themselves. Under such conditions, cooperation will break down (Kagel and Roth 1995; Olson 1965; Ostrom 1990).

Collective action can, however, be achieved if there is a credible threat of punishment. Punishment can force the costs of free riding above the costs of cooperation, thus removing any incentive to cheat. Rewards help too but, while they might encourage many people to cooperate, they cannot deter all of them from cheating, so they have an intrinsically weaker leverage. The effectiveness of punishment for promoting and maintaining cooperation has been demonstrated in numerous theoretical and empirical scenarios (Boyd et al. 2003; Fehr and Gächter 2000; Ostrom et al. 1992; Sigmund et al. 2001; Yamagishi 1986). The continuing problem, however, is this: Who bears the cost of punishment?

Punishment itself therefore becomes a “second-order” public good (Heckathorn 1989). Individuals may contribute to the original public good and yet free ride on others’ efforts to punish those who did not, putting us back to square one in achieving cooperation. The three main solutions to this conundrum are not credible for evolutionary explanations of human cooperation (Henrich and Boyd 2001): (1) punishment comes from state institutions (which are too recent); (2) punishment is not costly after all (punishment must yield some cost that, however small, makes non-punishment a better strategy over time); (3) second-order free riders (those who shirk from punishing others) are also punished (this leads to a requirement for the punishment of those who do not punish those who do not punish those, and so on, which merely paints the problem into the distance). A fourth possibility is that some group members are simply willing to incur the costs of punishment, as can occur in experimental games (Fehr and Fischbacher 2003; Fehr and Gächter 2002). Such “altruistic punishment” could have evolved via some form of cultural group selection (Boyd et al. 2003; Fehr and Fischbacher 2003). However, it remains to be shown that punishers in these empirical experiments do not expect some return benefit, let alone whether they would remain willing to punish in the non-anonymous context of real life, either today or in the past (Burnham and Johnson 2005; Johnson et al. 2003). So during human evolution, without any obvious incentives to punish, how did people achieve cooperation for public goods?

THE SUPERNATURAL PUNISHMENT HYPOTHESIS

One potential source of punishment that has not been considered in the literature on cooperation is supernatural agents (Johnson and Kruger 2004). Supernatural agents are often seen as the purveyors of moral codes and taboos, and many adherents feel obligated to cooperate with the community norms because of the threat of retribution these agents will exact upon them if they do not. That is, supernatural punishment exacted on them or their kin in everyday life, or in an afterlife. Whether

supernatural punishment is genuine or not is immaterial—as long as people fear it then we may expect them to modify their behavior accordingly. This follows the Thomases' dictum (Thomas and Thomas 1928:572): "If men define situations as real, they are real in their consequences." Once such beliefs are established, the costs of punishment are—in theory—partly offloaded onto a supernatural actor, offering a novel solution to the problem of second-order free riders.

Of course, other group members and leaders may punish as well under the auspices of local norms and laws, exacting social sanctions, fines, injury, starvation, imprisonment, ostracism, or death, sometimes on kin as well. Nevertheless, a concurrent threat of supernatural punishment makes the job of punishment easier if defections become rarer and retribution enjoys enhanced (religious) justification. Indeed, real-life sanctions are often meted out precisely in the name of supernatural displeasure. Elites can focus their energies on making sure people believe in supernatural punishment, instead of (or as well as) attempting to catch and punish people themselves.

In addition, other group members may gain personal payoffs by seeking to punish on their own if they are the ones who have been wronged. In the context of reciprocity or reputation effects, we may expect such moralistic aggression to be an adaptive trait bringing long-term benefits (Frank 1988; Trivers 1971).

Despite these other sources of worldly punishment, recent evidence suggests that religious beliefs also play an important role in the disposition to cooperate. An erroneous view has prevailed that, in cooperation experiments, people who hold religious beliefs behave identically to those who do not (Fehr and Gächter 2003). Recent work by Richard Sosis and others, however, has provided evidence that cooperation is significantly higher among those who are more devout (Sosis 2000; Sosis and Bressler 2003; Sosis and Ruffle 2003; Wilson 2002). Some such data are probably even rather conservative. The influence of a belief in supernatural punishment in low-stakes cooperation games for a few dollars is perhaps minimal; in real-life decisions of personal or social importance such beliefs are likely to play a much greater role. Clearly, supernatural punishment is limited by certain bounds. As Schneider (1957:798) put it, "A supernatural sanction which specifies that the criminal's left arm will fall off at high noon on the third day following the crime cannot be maintained for long except for such crimes as are practically never committed." More credible alternatives are often, however, still severe: disease and death are often cited, and represent inevitable occurrences at some point or other.

In summary, the fear of supernatural punishment offers a powerful mechanism that may have promoted cooperation toward public goods in our past, as it still does for millions of people today. Throughout, I focus on a single aspect of religion: the belief in supernatural punishment. The supernatural punishment hypothesis is not, therefore, exclusive of the possibility that other aspects of religion arose from other causes, such as cultural inventions, tools of elites to subjugate others, or by-products of humans' big brains.

THE ORIGIN AND UTILITY OF BELIEF IN SUPERNATURAL PUNISHMENT

Supernatural punishment offers a neat mechanism for the maintenance and reinforcement of norms if everyone already believes in it, but begs the questions of (1) how it originated in the first place; (2) why unbelievers who shirk the costs of supernatural beliefs would not do even better; and (3) what cognitive processes are involved to enable humans to entertain such costly beliefs. These are valid criticisms of many functional explanations of religion. Supernatural punishment, however, offers a novel response.

Throughout the evolution of the human lineage, selfish behavior would always have been selected for whenever the net (short- *and* long-term) benefits of action X outweighed its net costs, just as it would for slime moulds and zebras. Of course, selfishness may not pay off in the presence of kin, allies, mates, or dominant individuals, where self-interest at the expense of others can incur inclusive fitness costs or direct punishment (Clutton-Brock and Parker 1995; Hamilton 1964; Trivers 1971). But in most other situations, selfishness was always the best means to reproductive success and, when significant others were absent, uninvolved, or not looking, selfishness paid (Dawkins 1986). Our ancestors' life was therefore relatively simple in that social behavior could be selected (by both individual actors in real time and/or natural selection over evolutionary time) by the simple comparison of potential gains with potential costs. However, humans would later develop two extraordinary capabilities that would throw such simplistic calculations out the window.

The first extraordinary capability is the capacity to infer the contents of other minds. That is, humans developed a system which allowed them to envision the world from another individual's point of view, the so-called theory of mind. Of particular importance to the supernatural punishment hypothesis is one special component of this—the "intentionality system," a mental capacity geared towards identifying causal agents of events (Bering 2002; Bering and Shackelford 2004). In this new world, life became much more complicated with the knowledge that what one knows, others know too (and, conversely, knowing that others know what one knows oneself). There remains some debate about whether other species have some form of rudimentary intentionality system (see, for example, de Waal 1996; Povinelli and Bering 2002; Tomasello et al. 2003). In animals it is hard to separate out genuine inferences of others' mental states from alternatives. For example, evidence of anticipatory behavior may just as easily indicate learned associations between events as it does a true understanding of the agent's mental intention. As Tomasello acknowledges, whatever interesting cognitive abilities animals may have, even chimpanzees "clearly do not have a human-like theory of mind" (Tomasello et al. 2003:153). Even if some animals do have the capacity for complex mental inference, however, it has no bearing on my argument here.

The second extraordinary capability is unarguably human: language. When the human capacity for complex language developed, the significance of the intention-

ality system skyrocketed because not only could people now suffer from or manipulate other people's knowledge, people could suffer from or manipulate what other people *learn in absentia*. Information about person A could propagate via person B to person C, D, E, and so on, without end. This makes selfish behavior particularly dangerous because the probability and costs of social exposure increase rapidly with each newly informed individual (each person can tell several others). Even if B and C do not care, it may not be until person Z hears the news, or until *enough* people hear the news, or until some authority hears the news, perhaps weeks later, that punishment will come. The consequences of the spread of such information for reproductive success are significant: consider the impact of exposed crimes such as murder or adultery. Such events, and their social ramifications, would commonly have a major impact on fitness (Bering and Shackelford 2004). Providing new grist for evolution's mill, the more transparent social world of intentionality systems and language threw up a set of selection pressures that were entirely novel in the history of life.

Humans are both blessed and burdened with these cognitive innovations. At one end of the spectrum, Machiavellians could now perform behaviors not just because of the simple cost-benefit analysis of whether to do X or not, but with the added possibility to exploit others' knowledge about X. The potential for manipulation and deception would have suddenly come under significant selection pressure. Those who exploited this system effectively could enjoy significantly enhanced reproductive success. Those who did not would experience a comparative disadvantage. As an example, Bering and Shackelford (2004) argue that such behaviors as the murder of witnesses to crimes become the direct subject of natural selection, since this can preserve the self from social exposure.

At the other end of the spectrum, one would, for the first time in evolutionary history, have to be concerned about the dangers of this new social transparency. One's own selfish actions could be reported, inferred, remembered, discussed, gossiped about, and reprimanded—even by absent third parties after long delays. Impulsive selfish desires would suddenly become hazardous because of the increased risk of exposure and the social sanctions, fines, injury, starvation, imprisonment, ostracism, or death that may result. Increased restraint would therefore be crucial to maximizing personal gain through measured self-interest that falls short of incurring excessive costs in the face of disgruntled group members. I therefore suggest that—at the individual level—restraints on self-interested conduct contributed to fitness because it put a brake on antiquated desires that were too blatantly selfish for the subtleties of the new social world. Selfishness still paid, but only in more careful moderation than before.

The question was how to generate such restraint. The very mechanism that generated a more transparent social world, I argue, also generated a causal link to supernatural punishment for transgressing within it. Clearly, an understanding of causation via the intentionality system would have lent strong selective advantages in predicting and exploiting the vagaries of hunting, gathering, social exchanges,

and so on in our environment of evolutionary adaptation (EEA). As a consequence of the mind's constant search for agency, however, Bering (2002) argues that even random natural events such as drought or illness came to more easily fit with a cognitive disposition that they happened *for a reason*, rather than simply by chance alone. It is not logical, but it appears to be human nature. From there, it is a small step to assign the cause to some supernatural agency, given that such events apparently lie outside any human's ability to instigate them.

The capacity for agency and intentionality may be prerequisites for belief in supernatural punishment, but they need not automatically give rise to such beliefs. However, a long evolutionary history of adapting to positive or negative feedback from social interactions may have provided a ready template for the newly evolved intentionality system to infer events as deliberate responses to our actions. Costly and memorable misfortunes, in particular, may have stimulated a search (or a selection pressure, if it helped to avoid such negative events again in the future) for attributing cause and effect. A belief in supernatural agency, therefore, may have become a natural consequence of human brains fearful of invoking the calamities of nature upon themselves as a result of their actions. For the Inca and Maya, for example, Hultkrantz reports that "diseases were supposed to derive from crimes in the past—above all, theft, murder, adultery, and false testimony" (Hultkrantz 1967:233). Murdock reported that every single one of the 186 societies in his analysis attribute illness to the malicious work of some supernatural agent or other (Murdock 1980), and "spirit aggression" was the single most important theory of illness causation (appearing in all cases but two).

Murdock also pointed out that when life was more nasty, brutish, and short in our past, there would have been plentiful misfortunes for which to attribute potential causes and effects. Certainly, in the preindustrial era that is of interest for understanding the evolution of cooperation, one must not underestimate the cogency of supernatural explanations for natural events that are now well-understood scientific phenomena. The role of social interactions would also be important in this regard: (1) other group members may systematically warn of supernatural consequences for moral transgressions; (2) other group members are likely to scaffold individual beliefs if one's own suspicions about others are "confirmed" through gossip, e.g., Mary is barren because she is an adulterous woman; (3) the social perception that misfortunes indicate wrongdoing is likely to make one ever more concerned to avoid them—whether it is true or not, the social consequences will unfold nevertheless.

Pure Machiavellians would do well by exploiting the intentionality system without any checks on pursuing personal gain. But those who believe in supernatural punishment can do better still, because a god-fearing Machiavellian would do better than an indiscriminate one if the latter suffers from a higher risk of detection and retaliation by others in the community (Johnson and Bering in prep.). Unbelievers run a greater risk than believers if: (1) they are less able to control selfish impulses; (2) they underestimate the true risk of detection; or (3) they *accurately* estimate the

true risk of detection but this leads to more mistakes than unbelievers who overestimate it, a situation that arises wherever the costs of exposure exceed the benefits of selfishness (see Nettle 2004).

The supernatural punishment hypothesis suggests a basis for human cooperative tendencies and, perhaps, an adaptive forerunner to morals and ethics. Since it identifies adaptive advantages for the individual, it could arise independently in multiple different contexts. Group selection may be at work as well (if supernatural punishment promotes cooperation, groups with it would do better than those without), but while certainly adding significantly to a selective process, group selection need not be relied upon for the mechanism to operate. The next step is to test the hypothesis.

In the remainder of this paper I present a pilot test of the supernatural punishment hypothesis. The research question is simple: Is supernatural punishment associated with human cooperation?

METHODS

Data

I used data from the Standard Cross-Cultural Sample (SCCS) of 186 human societies around the globe (Figure 1), devised by George Murdock and Douglas White (1969). Quantitative variables describing a large number of characteristics of these societies have been coded via extensive research on the primary ethnographic literature, by a number of different people (see, for example, Murdock 1967, 1981; Ross 1983; Tuden and Marshall 1972). This database has become a well-established resource for testing hypotheses about human behavior and ecology across different world cultures.

The 186 societies are a subset of a much larger database on 1,267 societies comprised in the *Ethnographic Atlas* (Murdock 1967). The SCCS subset was carefully selected, non-randomly, in an effort to provide a representative sample of societies capturing all of the world's regions and diversity, and which was not biased by the contagion effects known as Galton's problem (in which cross-cultural comparisons can generate spurious correlations if common attributes have spread between societies—groups would not then represent independent data). The sample also excludes societies recently descended from a single one, for similar reasons (the rule of thumb requiring a separation of around 1,000 years; so, for example, French Canadians and the French could not both be included). Obviously, societies that lack enough information are not included, but Murdock made it a goal to include data spanning the universe of cases, seeking to have a representative society from all areas of the world. To exclude certain areas would be to fail to represent the true population of world cultures. Murdock also believed that to exclude modern, historical or prehistoric societies would also arbitrarily truncate the data. This is where the SCCS diverges from the Human Relations Area Files (Lagace 1979), which

Figure 1. Distribution and coding of “high gods” across the Standard Cross-Cultural Sample (Murdock 1967). Coding levels are as follows: (1) absent or not reported; (2) present but not active in human affairs; (3) present and active in human affairs but not supportive of human morality; (4) present, active, and specifically supportive of human morality.



specifically excludes such societies. Murdock regarded this exclusion as “a thoroughly indefensible example of anthropological provincialism” because it advised rejecting data compiled by historians (Murdock 1981:6). SCCS sources also strive to glean data from the earliest descriptions of the societies, where possible, to reduce the likelihood of European influence on cultural characteristics (Murdock and White 1969).

Although much has already been done with the SCCS data to produce a statistically valid sample, I repeated all analyses using two variables to control for some of these possible confounds: (1) region of the world from which each society comes, to control for the possibility that variables tend to have certain values in particular areas of the globe (SCCS variable 200); and (2) type of religion, to control for the fact that some so-called “classical” religions (e.g. Christianity, Islam) have spread widely in recent history, which may compromise the statistical independence of each society’s belief in high gods (713; both detailed in the appendix). There are a number of discussions of the SCCS database in the journal *World Cultures*, online, and elsewhere (e.g., Ember and Ember 1998).

The appendix lists all variables used in the analysis, their original code number in the SCCS database, their coded values, the number of societies corresponding to each value, and the original reference. They are discussed in detail below.

Measures of Supernatural Punishment

The ideal variable for this study would be a measure of *the extent of belief in supernatural punishment for selfishness* within each society. Unfortunately, no such variable exists in the SCCS database. Therefore, I used the existing variable “high gods” as a surrogate (238). As outlined by Murdock (1967:52), a high god follows the definition of Guy Swanson (1960: chapter III and appendix 1) as “a spiritual being who is believed to have created all reality and/or to be its ultimate governor, even though his sole act was to create other spirits who, in turn, created or control the natural world” (I have included both authors’ exact definitions and coding in Table 1). The salient feature for this study is that high gods vary in their activity in human affairs and their concern with human morality. The SCCS data codes high gods for each society as: (1) “Absent or not reported,” (2) “Present but not active in human affairs,” (3) “Present and active in human affairs but not supportive of human morality,” and (4) “Present, active, and specifically supportive of human morality” (Divale 2000).

The logic behind using this variable is that, on average, over the whole sample, the importance of high gods should be associated with the extent to which moral codes are imposed by a supernatural source, and the likelihood that a deity is believed to exact supernatural punishment on transgressors who flout them. As originally developed by Swanson, the variable “high gods” includes the key feature of how much gods “seem to care whether virtue triumphs or the wicked go unpunished” (Swanson 1960:57). Hence, I simply suggest that the four levels of this vari-

Table 1. Exact Definitions and Coding Descriptions of the Variable "High Gods" from All Sources

| Source | Definition | Coding | | | |
|--|---|--|--|--|--|
| | | 1 | 2 | 3 | 4 |
| SCCS database (Divale 2000) | None given | "Absent or not reported" | "Present but not active in human affairs" | "Present and active in human affairs but not supportive of human morality" | "Present, active, and specifically supportive of human morality" |
| <i>Ethnographic Atlas</i> (Murdock 1967:52) | "A high god is defined, following Swanson [1960; chapter 3 and appendix 1], as a spiritual being who is believed to have created all reality and/or to be its ultimate governor, even though his sole act was to create other spirits who, in turn, created or control the natural world" | "A high god absent or not reported in substantial descriptions of religious beliefs" | "A high god present but otiose or not concerned with human affairs." | "A high god present and active in human affairs but not offering positive support to human morality" | "A high god present, active, and specifically supportive of human morality" |
| Swanson (1960:209–210) | "Refers to a spirit who is said to have created all reality and/or is reality's ultimate governor. Includes spirits whose sole act was to create the other spirits who, in turn, produced the natural world" | "None" | "Present—otiose" | "Present—active in human affairs but no specific support to human morality" | "Present—active in human affairs and gives specific support to human morality" |

able index the likelihood of supernatural punishment from high gods as: (1) zero, (2) low, (3) medium, and (4) high.

Some caveats are in order at the outset. Even if the variable “high gods” precisely equated with the extent of belief in supernatural punishment from them (which it probably does not), it cannot be a perfect index of expected punishment for norm transgressions as a whole. This is because among the diversity of world cultures: (1) not all high gods are expected to punish all transgressions; (2) not all supernatural punishment is attributed to high gods (it is sometimes expected in addition, or instead, from other supernatural agents, such as dead ancestors, spirits, or witches); and (3) not all punishment, of course, is supernatural: transgressors may suffer worldly punishment from real people as well (see Figure 2). However, this does not constitute any flaw in the analysis. These other possibilities will add noise to the data, but if there is a link between high gods and cooperation, we can nevertheless test for the predicted statistical correlation between them even with these other sources unaccounted for. If anything, it will serve to ensure a conservative analysis of the hypothesis under test, given that the explanatory variable is limited to a single form of punishment when others are possible too (Type II errors, finding no relationship when there is one, will increase). If we are to find correlations between high gods and cooperation, then they would have to represent an especially powerful effect to emerge despite such noise in the data. Note that this also depends on *how* alternative sources of punishment vary with high gods: (1) if randomly, then they just constitute noise; (2) if negatively, then they work *against* the proposed hypothesis so finding high gods to be important would be evidence of a strong relationship; (3) if positively, then this may be problematic as they could themselves account for cooperation, rendering the relationship with high gods spurious. Other studies are clearly needed to test for relationships between cooperation and the other sources of punishment in Figure 2. “High gods” is not a perfect variable. But on the other hand, it and the SCCS data provide an extraordinary resource for a first test.

Measures of Cooperation

I examined the 2,000 variables currently available in the SCCS database for potential measures of cooperation (Divale 2000). None stand out as ideal or direct measures of the propensity to cooperate. Nevertheless, several surrogate measures may serve to indicate the extent to which the society is composed of cooperatively inclined citizens that are geared towards contributing to the public good. These variables are detailed in the appendix and are predicted to vary as follows. I hypothesized that societies in which high gods are more active and concerned with human morality will be:

1. Larger, since their success in achieving cooperative pursuits will have allowed them to expand, avoid fission, and compete successfully with other societies (SCCS variables 63, 235, 237; see also Alexander 1987; Roes and Raymond 2003)

Figure 2. Sources and inevitability of punishment. The use of the variable “high gods” as an index of supernatural punishment implies (shaded): (1) high gods always punish and (2) no other sources punish. However, in some societies, high gods do not always punish while other supernatural agents and group members sometimes do punish. As explained in the text, however, the prediction holds despite these sources of noise.

| | | Inevitability of punishment | |
|----------------------|---------------------------|-----------------------------|---------------|
| | | Punish | Do not punish |
| Source of punishment | High gods | Implied | Possible |
| | Other supernatural agents | Possible | Implied |
| | People | Probable | Implied |

2. More compliant with social norms and decisions (775)
3. More able to lend money and use abstract media of exchange, since this requires high degrees of trust and guarantees (17, 18; see discussion of this in Swanson 1960: chapter IX)
4. More loyal to the local and wider community (778, 779)
5. More sharing with food (1718; though this may also vary with ecological circumstance)
6. Have centralized enforcement and sanctioning systems, since the society will be more likely to accept and share a common system of “God-given” morals that identify inalienable rights and wrongs (90, 776, 777, 1743)
7. More likely to pay taxes, since people may be more willing to contribute to the public good (784; of course, taxes are often collected coercively by elites, so I do not expect them to solely reflect willing cooperation)
8. Less likely to experience internal conflict, if common moralizing regulations bind the society together in common cause (1649, 1748, 1749, 1750, plus a composite averaging six other internal conflict variables, following Roes and Raymond 2003)

Data Reliability

SCCS data come from a variety of sources, and although they follow similar general principles, they vary in the methods and people involved in coding them. Swanson’s (1960) original classification of high gods in his sample of 50 societies provided a test of reliability. He reported a significant correlation between his own coding and that of two research assistants for a subset of 20 cases ($r = 0.81$; $p < 0.01$), based on examination of the same monographs. The larger SCCS database of 186 societies now has 168 with a classification for high gods. Swanson’s work was

extended in a global study by Davis (an unpublished Ph.D. dissertation, discussed in Peregrine 1995a), and a study of native North American societies by Peregrine (1995a, 1995b). Both Davis and Peregrine had trouble replicating many of Swanson's operational definitions and findings. They did, however, both replicate Swanson's findings regarding high gods, suggesting that the coding for that variable at least (one of several) was consistent with Swanson's original definitions.

Variables indexing cooperation also have some indications of reliability, ranging from the variable police (90), which had high (but unspecified) correlations for inter-coder reliability (see Tuden and Marshall 1972:452–453), to the variable compliance (775), which was deemed by the researchers to have been very difficult to code (see Ross 1983:172). For the latter, I double-checked my test results with a reliability rating from the same study (see Table 2). Ross (1983) also reports little evidence that the order in which societies were coded had any influence on values assigned. He did, however, find that ratings of data quality were occasionally correlated with values coding "presence" or "high levels" of the target variable, implying that data richness might lead to certain values rather than others. However, the direction of cause and effect was unclear: more prominent features might have led to higher subjective confidence in the coders' ratings of data quality (whereas finding nothing or little evidence for the same features might give the impression of a lack of data). For some SCCS variables there are no specific discussions of reliability, whereas other variables are extensively reexamined and recoded by subsequent researchers (e.g., 1649). It is worth noting that one of the virtues of the open-access SCCS database is that it undergoes regular scrutiny, revisions, and updates (Divale 2000). While lauding the remarkable efforts of the SCCS data compilers over the years, my solution to the various potential problems was, where possible, to test hypotheses using several similar variables (e.g., three measures of society size: 63, 235, 237).

Statistics

For the basic results I used Kendall's tau-b statistic to assess relationships between SCCS variables, given that they mostly represent ordinal data (see appendix; the control variables, region (200) and religion (713), are nominal and therefore treated as factors in multivariate tests). Kendall's tau-b has advantages over Spearman's rank correlation coefficient, especially with small sample sizes and where there are ties in the rankings, when *p*-values for Spearman's ρ can be misleading (Sokal and Rohlf 1995).

Because I test a number of correlations, some may reach statistical significance by chance. I therefore applied a sequential Bonferroni technique for multiple comparisons, which controls for the increased number of Type I error rates (false rejections of the null hypothesis) in a posteriori multiple significance testing (Rice 1989). Standard Bonferroni tests (where the significance level is simply divided by the number of tests) are not adequate, because they increase Type II error rates where

Table 2. Results of Correlations between the Variable “High Gods” and Various Indices of Societal Cooperation. See Table 1 and the appendix for further details of these variables. Also included are significance tests controlling for (A) multiple inference testing, using sequential Bonferroni corrected significance levels (“X” = remains significant), and, using ordinal regression models, (B) region of the world from which the societies come (200), (C) classical, mixed, or pre-classical religion (713), and (D) both region and religion. Note that predicted directions hinge on SCCS coding; higher numbers do not always mean higher levels of the variable (see appendix).

| SCCS No. | Variable | Predicted direction | Kendall's tau-b | N | P (2-tailed) | <i>Controlled for</i> | | | |
|-------------|--|------------------------|--------------------|-----|--------------|-----------------------|---|---|---|
| | | | | | | A | B | C | D |
| 17 | Money (media of exchange) and credit | + | +0.234 | 167 | <0.001 *** | X | + | | |
| 18 | Credit source | + | +0.218 | 155 | 0.002 ** | X | | | |
| 63 | Community size | + | +0.140 | 168 | 0.027 * | | | | |
| 90 | Police | + | +0.216 | 164 | 0.002 ** | X | | + | |
| (p = 0.06) | | | | | | | | | |
| 235 | Mean size of local communities | + | +0.179 | 139 | 0.01 ** | | | | |
| 237 | Jurisdictional hierarchy beyond local community | + | +0.283 | 167 | <0.001 *** | X | + | | |
| 775 | Compliance of individuals with community norms | – | –0.005 | 81 | 0.958 † | | – | – | – |
| 776 | Formal sanctions and enforcement for community decisions | – | –0.189 | 85 | 0.047 * | | – | – | – |
| 777 | Enforcement specialists (police, tax collectors) | – | –0.042 | 84 | 0.666 | | | | |
| 778 | Loyalty to the local community | – | –0.028 | 78 | 0.775 | | | | |
| 779 | Loyalty to the wider society | – | +0.067 | 79 | 0.489 | | | | |
| 784 | Taxation paid to community | – | –0.271 | 80 | 0.006 ** | | | | |
| 1649 | Frequency of internal warfare (resolved rating) | – | –0.045 | 139 | 0.524 † | | | | |
| 1718 | Sharing of food | + | –0.153 | 72 | 0.123 | | | | |
| 1743 | Sanctions | + | +0.303 | 74 | <0.01 ** | X | + | | |
| 1748 | Frequency of internal warfare | – | +0.289 | 36 | 0.046 * | | | + | + |

(p = 0.08)

Table 2. (continued)

| SCCS No. | Variable | Predicted direction | Kendall's tau-b | N | P (2-tailed) | Controlled for | | | |
|-------------|---|------------------------|--------------------|----|--------------|----------------|---|---|---|
| | | | | | | A | B | C | D |
| 1749 | Frequency of internal warfare involving non-territorially organized groups within unit of maximal political authority | — | +0.095 | 36 | 0.516 | | | | |
| 1750 | Frequency of violent conflict between groups within local communities | — | +0.093 | 65 | 0.41 | | | | |
| — | Mean of six internal conflict variables (see appendix) | — | −0.036 | 64 | 0.717 | | | | |

* Significant at $p < 0.05$ level.** Significant at $p < 0.01$ level.*** Significant at $p < 0.001$ level.† Also not significant when omitting level 3 “highly variable,” and when controlling for a data-quality variable available for that study (797; ordinal regression, estimate: -0.016 , $p = 0.93$).‡ Also not significant when controlling for a reliability coding of this variable (1652; ordinal regression, estimate: -0.120 , $p = 0.39$).

more than one component hypothesis is false (i.e., they reduce power in detecting significant results). Test results are therefore reexamined under newly derived significance levels (column A in Table 2), judged by a test of $P_i \leq \alpha / (1 + k - i)$ where all original P -values are ranked in ascending order (P_1, P_2, \dots, P_i) for k tests. The adjustment thus gives a different critical P -value for each test.

I used ordinal logistic regression (1) to double-check relationships while controlling for potentially confounding variables, and (2) to build a multivariate model testing the effects of several independent variables at once.

RESULTS

Table 2 details the results of the statistical analysis. High gods were significantly associated with 10 of the 19 independent variables tested, and 14 of the relationships were in the predicted direction. All but one of the 10 significant results (frequency of internal warfare, 1748) were in the predicted direction. Five of these remained significant following Bonferroni corrections for multiple inference testing (column A of Table 2). Ordinal logistic regressions were conducted to double-check all relationships while controlling for the variable region (200; column B), religion (713; column C), or both (column D), with any significant relationships and their direction reported in Table 2 (note that the effective sample size is reduced in these multivariate analyses). Below, I summarize the results in order of the predictions outlined in the Methods section, on pp. 420–421.

All measures of society size were significantly related to high gods, but only jurisdictional hierarchy (237) following Bonferroni corrections, and when controlled for region. None of the other society size variables was significant in any controlled test. Roes and Raymond (2003) found similar results using an earlier version of the SCCS and variable 237 (for which they report Kendall's tau = 0.29, $n = 167$, $p < 0.0001$) and when using the larger, *Ethnographic Atlas* database (they report Kendall's tau = 0.37, $n = 724$, $p < 0.0001$).

Compliance with community norms (775) was not significant in the basic test, nor when removing the coding level 3 (for “highly variable”) given Ross's (1983) comments on the difficulty of coding this variable. However, the original variable did become significant in two of the controlled tests.

Lending of money and media of exchange (17, 18) were both significantly related to high gods, including after Bonferroni corrections, as well as lending of money when controlling for region. Neither was significant in any of the other controlled tests.

Loyalty to the local or wider community (778, 779) was unrelated to high gods in either basic or controlled tests, as was sharing of food (1718).

Centralized enforcement and sanctioning systems were significantly related to high gods in three of the four cases (90, 776, 1743, but not 777). Police (90) and sanctions (1743) remained significant following Bonferroni corrections and in one controlled test each (although police was only of borderline significance). Formal

sanctions (776) was significant in all controlled tests (except the Bonferroni test), and enforcement specialists (777) in none.

Payment of taxes to the community (784) was significantly associated with high gods, but not in any controlled test.

Finally, none of the internal conflict variables was significantly associated with high gods (1649, 1749, 1750, plus the composite of six other internal conflict variables) except one: frequency of internal warfare (1748), which held significant in one of the controlled tests. This relationship was in the opposite direction to that predicted, such that increasing importance of high gods was associated with more warfare.

Multiple Regression Model

Finally, I conducted an ordinal regression with high gods as the dependent variable. I included as independent variables all those that remained significant in the individual tests after Bonferroni corrected significance testing (as in Table 2). Region and religion were once again entered as control factors. This resulted in a significant model containing all five variables ($\chi^2 = 111.78$, d.f. = 78, $p = 0.007$; Cox and Snell $R^2 = 0.76$). Coefficients for each of the variables in the equation (that is, their effect on the model given the simultaneous influence of all the other included variables) indicated that none were significant as independently contributing factors, largely because they are intercorrelated (all $r > 0.40$, all $p < 0.0001$). Nevertheless, controlling for region and religion, these variables were together able to explain a large amount of variation in the variable "high gods."

DISCUSSION

Among a representative sample of 186 human societies, high gods are significantly associated with societies that are larger, more norm compliant in some tests (but not others), loan and use abstract money, are centrally sanctioned, policed, and pay taxes. In the one instance of a significant relationship conflicting with predictions, high gods were associated with more internal conflict (though only one of five such measures). Inasmuch as increasing levels of high gods tend to threaten negative consequences for those who disregard the norms of the community, this provides some support for the notion that supernatural punishment may be associated with cooperation among human societies. Theories that hold that religion is an arbitrary by-product of big brains or culture do not predict any relationship between indices of cooperation and whether moralizing gods are present or not.

It must be noted that cause and effect remain obscure. For example, it is possible that, as societies become larger and more regulated within larger political structures, elites increasingly encourage the institutionalization of moralizing gods to authenticate their power and subjugate the populace (Cronk 1994). In addition, both high gods and better cooperation may occur among societies that are more ad-

vanced politically (Swanson 1960), economically (Underhill 1975), or technologically (I found that high gods are associated with SCCS variable 158.1, "Sum of cultural complexity": Kendall's tau = 0.246, $N = 168$, $p < 0.0001$). Therefore, it is possible that high gods and some of the independent variables tested in this paper are simply associated on account of their common occurrence in more "modern" communities. Certainly, high god concepts are often assumed to be a feature of modern religions, rather than of early forms (Swanson 1960; Weber 1978). However, in the SCCS data, high gods is *negatively* associated with variable 713 "religion," meaning that high gods are actually more commonly represented among "pre-classical" religions than among the more recent, "classical" ones (such as Christianity and Islam; Kendall's tau = -0.319 , $N = 85$, $p = 0.001$).

While bearing in mind the possible conflation with modernity, it is interesting to consider the possibility that one reason societies were able to develop cultural complexity in the first place is partly on account of the cooperative benefits attained through a belief in moralizing gods. In a similar vein, the handful of very successful religions to which most of Earth's population subscribe (in particular, Christianity and Islam) have expanded in part as a result of the successful spread of ideas (and, of course, the sword) across populations that were formerly otherwise inclined. One could speculate that the success in and apparent pertinence of these religions to so many diverse communities and ecologies may not be coincidental with their stress on supernatural punishment (as well as their great rewards; Coward 2003). If supernatural punishment has indeed been an important factor in overcoming the challenge of human cooperation, one would predict that monotheistic religions stressing sin and salvation may have become the more successful as a result.

The analysis presented here does not distinguish among competing adaptive theories of religion, and it therefore offers complimentary evidence for other theories that predict a relationship between high gods and cooperation. Many "social-solidarity" theories, while they stress different underlying mechanisms, concur with the idea that religious beliefs—for a variety of proposed reasons—enhance group cooperation (Sosis and Alcorta 2003). Therefore, while I claim to provide support for the supernatural punishment hypothesis (inasmuch as high gods is a good index for this), the results presented here are not inconsistent with other adaptive theories of religion. For example, if "costly signaling" via rituals is the driving mechanism behind religion (as suggested by Irons 2001 and Sosis 2003), then we may also expect a relationship between high gods and the indices of cooperation in Table 2, since high gods may also be associated with more costly rituals. We therefore need to extend and develop these kinds of empirical analyses in more exacting ways to tease apart different adaptive theories.

Two unexpected results are worth exploring briefly. The one instance of a significant (positive) relationship between high gods and internal conflict (1748) may be spurious given the fact that four other measures were unrelated. However, the relationship held in two of the controls. There are a number of possible interpretations of how high gods might influence internal disputes, and it is possible to imag-

ine conditions in which one may expect more such conflict. Firstly, factions that wage internal violence against rivals may be religiously motivated. They may even be fighting to enforce religious observance. Secondly, as Roes and Raymond (2003) suggest, moralizing gods may only exert an effect on subduing internal conflict when the society faces a common threat. At other times internal disputes may persist, for a number of other reasons, regardless of the presence of high gods.

Although there was no relationship between high gods and sharing of food, other factors may dominate such activities. In a recent study of cooperation in 15 small-scale societies, Henrich et al. (2004) found that two societies that both shared food extensively nevertheless demonstrated very different levels of underlying cooperation when playing a simple economic exchange called the “ultimatum game” (Kagel and Roth 1995). The Ache of Paraguay are humble in their sharing of food, even avoiding advertising their hunting success, to the extent that they and their kin do not benefit from greater individual hunting success. The Ache were highly cooperative in the ultimatum game. In contrast, the Hadza of Tanzania share food, but only grudgingly, and commonly try to avoid doing so at all. The Hadza were much less cooperative in the ultimatum game and also commonly punished uncooperativeness. According to the authors, “cooperation and sharing is enforced by a fear of punishment that comes in the form of informal social sanctions, gossip, and ostracism” (Henrich et al. 2004:40). Hence, correlating high gods with the amount of food sharing per se may conceal two things: (1) underlying differences in dispositions towards cooperation, and (2) a key alternative source of punishment (as in Figure 2).

Avenues for Future Empirical Tests

There are several clear opportunities for follow-on studies. Firstly, measures of supernatural punishment were imprecise. More explicit data on beliefs in supernatural punishment are clearly needed, and a newly coded SCCS variable indexing the extent of belief in supernatural punishment would be the ideal. Measures of cooperation were also imprecise. Explicit experimental tests such as those of Henrich et al. (2004) would index baseline dispositions towards cooperation more effectively (though data collection would be extremely labor intensive). They would also (1) avoid masking effects such as in the food sharing example above, and (2) allow one to account for *individual* variation in both (a) the level of cooperation and, if surveyed at the same time, (b) the extent of belief in supernatural punishment. Tying these together in individuals rather than as aggregates among groups may be a much more effective method of analysis (individual variation may obscure any between-group differences).

Secondly, as was made clear in Figure 2, high gods do not account for all punishment. Therefore, future empirical tests should also test whether cooperation varies with (1) alternative sources of supernatural punishment and (2) real punishment by other people. Multivariate tests pitting such different explanatory variables—high

gods, other sources of supernatural punishment, and real-world punishment—at the same time against dependent variables indexing cooperation would indicate which of these sources of punishment holds greatest explanatory power.

A powerful test of the supernatural punishment hypothesis would combine studies of each of Tinbergen's (1968) four levels of explanation of behavior: (1) function (how it impacts on survival and reproduction), (2) causation (the proximate stimuli and recent learning), (3) development (necessary conditions for development and change with age), and (4) evolutionary history (its occurrence in similar species and possible phylogenetic origins).

Functional studies, for example, could collect specific life history data on members of preindustrial cultures and identify links between their individual beliefs in supernatural punishment and their reproductive success.

Causation studies could identify whether supernatural primes trigger more cooperation in laboratory experiments (Bering et al. 2005 [this issue], for example, found people were less likely to cheat in the purported presence of a ghost). Brain imaging studies might serve to test for links between these conditions and brain areas associated with the intentionality system and theory of mind.

Developmental studies could identify whether, when, and how children develop and/or learn to connect supernatural agency with cooperative behavior. Some work has been done along these lines (Bering 2004; Bering and Bjorklund 2004), but further studies specifically targeting cooperation behavior are needed.

Evolutionary history studies could work to resolve the controversial issues surrounding the degree of mental inference possible among primates and humans, as well as the similarities and differences in the role of punishment in their cooperation behavior. Identifying more precisely *when* humans developed the prerequisite mental capacities for entertaining supernatural ideas would help to identify the plausibility and consequences of the theory.

A further string to the bow of the supernatural punishment hypothesis is that it also offers an explanation for some *non-religious* forms of supernatural beliefs, including cults, folklore, common superstition, and just-world beliefs, all of which can in theory promote cooperation in precisely the same way as described for supernatural punishment. Each invokes the intentionality system in assigning cause and effect (though this may be less obvious than inferring actions of specific supernatural agents). Many of these other types of supernatural beliefs do not have rituals, however, whereas others do, raising the possibility that these differences might allow a test to tease apart theories of costly signaling and supernatural punishment. And yet, it is clear that the supernatural punishment hypothesis need not be mutually exclusive of other explanations for religious behavior. For example, belief in supernatural punishment may be a necessary corollary to make religious rituals appear worthwhile to adherents, facilitating their perception of low costs for the same costly activities that deter unbelievers who could otherwise join the club for free (Sosis 2003). Or, public or ritualized displays of a belief in god's punishment may itself represent a hard-to-fake signal that facilitates cooperation with others (a

convincingly god-fearing person might make a trustworthy trading partner, for example). At the least, the intentionality system may be a key predisposing factor that led to the development of rituals surrounding the causation of natural events, such as rains, droughts, or illness.

Additional Empirical Support for the Supernatural Punishment Hypothesis

The supernatural punishment hypothesis comprises five components (Figure 3): Ancestral selfishness (A) was compromised by the evolution of the intentionality system and language (B), which increased costs of social exposure (C). The resulting novel selection pressures favored a belief in supernatural punishment (D) (a belief itself requiring the intentionality system), which increased levels of cooperation to minimize perceived (supernatural) and actual (group-member) costly punishment (E). The empirical analysis presented here was restricted to the relationship between D and E. Below, I briefly outline some recent support for other aspects of the theory.

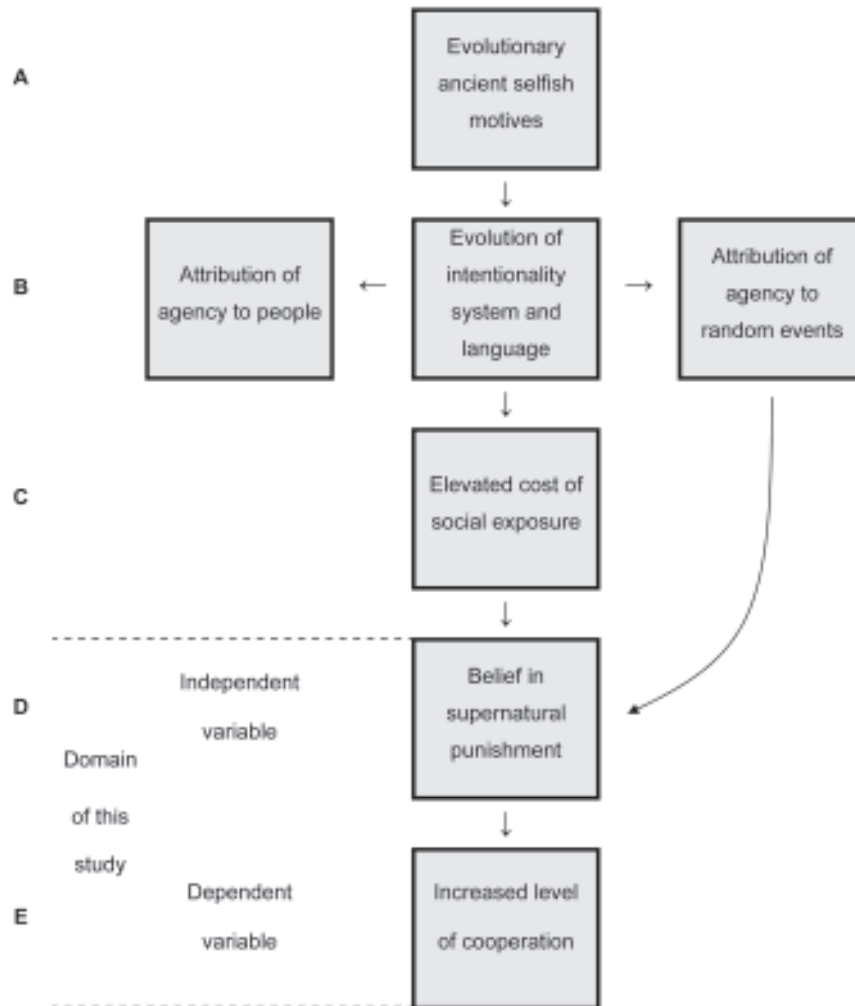
Component A: Ancient Selfish Motives. The idea that selfish motives are evolutionarily ancient is implicit in evolutionary biology and behavior (Krebs and Davies 1993; Wilson 2000). Although apparent unselfish behavior may emerge in some situations from the indirect effects of cooperation with kin, allies, mates, dominant individuals, and so on (Alexander 1987; Clutton-Brock and Parker 1995; Hamilton 1964; Trivers 1971; Zahavi 1995), the fundamental rubric is that behavior is usually selfish (Dawkins 1986).

Component B: Evolution of the Intentionality System. The origins and consequences of the intentionality system have been extensively developed both theoretically and empirically elsewhere by Bering and colleagues (Bering 2002, 2004; Bering and Bjorklund 2004; Bering and Johnson 2005; Bering and Shackelford 2004). I therefore will not expand on it here.

Component C: Costs of Social Exposure. This component is discussed by Bering and Shackelford (2004). Here I add some recent support. The supernatural punishment hypothesis predicts that, assuming there is some variation in disposition among individuals, cheats will tend to underestimate the probability and/or cost of exposure (implicating the utility of a corrective mechanism, such as law-abiding or god-fearing). A recent survey by Robinson and Darley (2004) suggests precisely this. Among contemporary criminals, those caught and convicted tend to downplay (1) capture probability and (2) punishment cost, and it is this that contributes to their decision to commit the crime. This implies (but of course does not prove) that people who accurately estimate or overestimate these factors are less likely to cheat and thereby avoid the costs of punishment.

Secondly, the supernatural punishment hypothesis predicts that if selfishness rep-

Figure 3. The key components (A–E) of the supernatural punishment hypothesis.



resents an evolutionarily ancient motivation with which the intentionality system has come into competition, then we should see examples of ancient selfish motives that endanger social status in our cognitively sophisticated, modern society. Terry Burnham (2001) has popularized the many possible ways in which ancient pleasure pathways lead us into socially costly behavior, such as addiction and infidelity. Another example is “crimes of passion,” antisocial behaviors driven partly by emotional arousal that are hard to control even among normally law-abiding citizens (Goldstein 2002). A number of neurological studies are intriguing too. Violence, for example, has well-understood neural pathways that some individuals cannot control as well as others (Davidson et al. 2000). Another study of choices among

immediate versus future rewards found that people experience the directly conflicting activation of two brain regions. Evolutionarily older regions of the limbic system favored immediate over delayed rewards whereas newer regions of the cortex were neutral between them (McClure et al. 2004). Those with more cortex activation were more restrained.

Component D: Belief in Supernatural Punishment. The supernatural punishment hypothesis predicts that a fear of supernatural punishment will be a common theme among all humans' brains, even if manifested in diverse ways. In other words, although I looked at *variation* in such beliefs in this study, if the theory is correct, we might expect selection to have established these specific beliefs widely. Cross-cultural studies support the widespread prevalence of some form of supernatural agent capable of exacting punishment for norm transgressions. Although only 23.8% of 168 societies in the SCCS data and 24.2% (of 748) in the *Ethnographic Atlas* have moralizing high gods (i.e., high gods coded as level 4; Murdock 1967), other supernatural sources are clearly important even where high gods are not. For example, 100% of SCCS societies attributed a supernatural source of one kind or another as a "predominant" or "important" cause of illness (Murdock 1980). Swanson's (1960) study of 50 societies reported 48.7% with high gods present (15.4% as level 4); 67.3% with "active ancestral spirits" that influence the living in some way; and 26.0% with "reincarnation." Also prevalent in his study were supernatural sanctions, "rewards or deprivations from supernatural sources (spirit or mana) which are believed to affect an individual because he harmed or helped other members of the same society" (Swanson 1960:212). A number of his societies believed such supernatural sanctions to affect people's health (42.0%), afterlife (27.7%), or some other aspect of life such as accidents, misfortunes, or mishaps (62.5%; these three figures for supernatural sanctions are minimums, because 0 was coded as absent *or* no data). What is critical, given that supernatural punishment may be effective regardless of its source, is that at least one of the above six beliefs appeared in 92.0% of Swanson's societies.

Link between D and E: Swanson (1960: chapter IX) found that among the 50 societies in his study, supernatural sanctions were significantly associated with high levels of interpersonal relations especially subject to stresses and strains, where he hypothesized the solidarity of group members would be most tested. He found significant associations with the incidence of debts, social classes, individually owned property, and primogeniture (sole inheritance by the oldest child). His conclusions that supernatural sanctions and moral behavior are tightly linked rejected earlier assertions that primitive religions were unassociated with ethics (Tylor 1948 [1871]), and favored the converse view of Malinowski cited at the beginning of this article. Swanson's variables indexing supernatural sanctions were never extended to the full 186 SCCS societies (Peregrine 1995a).

CONCLUSIONS

While empirical tests to convincingly demonstrate the supernatural punishment hypothesis, as well as to test it against competing alternatives, have yet to be undertaken, the hypothesis appears to offer a mechanism that avoids many of the pitfalls of evolutionary explanations of religion. By virtue of its foundation on specific cognitive processes (the intentionality system), and on the individual selective advantages it is suspected to confer (reducing the risks and costs of exposure in a socially transparent, mentally sophisticated, gossiping society), the supernatural punishment hypothesis offers a plausible origin for such beliefs, unreliant on (though perhaps augmented by) group selection, and offers a mechanism to promote cooperation while avoiding the “second-order” public good problem outlined at the beginning (about who bears the costs of punishment) that remains problematic for scholars of human cooperation (Bering and Johnson 2005; Johnson and Bering in press; Johnson and Kruger 2004).

The problem of second-order free riders remains an important one. My view is this: People do not bear the cost of punishment, at least *not for the sake of the group*. Social transgressions typically have a victim—either directly if hurt, betrayed, cuckolded, or stolen from, or indirectly if the cheat takes resources otherwise available to others. It can therefore be in the interests of the wronged party to seek personal punishment on the cheat if this will bring reciprocal benefits or maintain a reputation (Frank 1988; Trivers 1971). Ganging up with kin or allies can further reduce the costs of doing so (Wrangham 1999). Such a view is supported by recent evidence of an emotional and neural basis for the punishment of unfairness or betrayal (de Quervain et al. 2004; Fehr and Gächter 2002; Sanfey et al. 2003). Because of the costs of such interpersonal retaliation exacted upon cheats (greatly heightened by the intentionality system), people may be better off avoiding transgressions in the first place. Certainly, they need a system to balance their evolutionarily ancient but ever-present triggers for selfish behavior. The threat of supernatural punishment is one mechanism that might have led to such a disposition.

Supernatural punishment appears to have been an important influence on a great many people's behavior both in the present and the past, as noted by Bronislaw Malinowski 70 years ago. Recent theory and evidence suggest that this has significant implications for understanding the evolution of cooperation (Bering in press; Bering and Johnson 2005; Johnson and Bering in press; Johnson and Kruger 2004). Shakespeare's notion of the guilty mind on high alert takes on a powerful meaning in light of the selective effects of the human intentionality system. If a fear of god added new caution over our deeply rooted selfishness, our enhanced cooperative tendencies may have given us a selective advantage over those who were less prudent in their selfishness.

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APPENDIX
VARIABLES IN THE ANALYSIS (DIVALE 2000)

| SCCS No. | Variable | N | Code | Code Description | Reference |
|----------|--------------------------------------|-----|------|---|-------------------------|
| 17 | Money (media of exchange) and credit | 3 | | Missing data | Murdock and Morrow 1970 |
| | | 77 | 1 | No media of exchange or money | |
| | | 12 | 2 | Domestically usable articles as media of exchange | |
| | | 26 | 3 | Tokens of conventional value as media of exchange | |
| | | 42 | 4 | Foreign coinage or paper currency | |
| | | 26 | 5 | Indigenous coinage or paper currency | |
| 18 | Credit source | 17 | | Missing data | Murdock and Morrow 1970 |
| | | 113 | 1 | Personal loans between friends or relatives | |
| | | 26 | 2 | Internal money lending specialists | |
| | | 23 | 3 | External money lending specialists | |
| | | 7 | 4 | Banks or comparable institutions | |
| 63 | Community size | 1 | | Missing data | Murdock and Wilson 1972 |
| | | 28 | 1 | < 50 | |
| | | 28 | 2 | 50–99 | |
| | | 45 | 3 | 100–199 | |
| | | 32 | 4 | 200–399 | |
| | | 29 | 5 | 400–999 | |
| | | 15 | 6 | 1,000–4,999 | |
| | | 5 | 7 | 5,000–49,999 | |
| | | 3 | 8 | > 50,000 | |

| SCCS No. | Variable | N | Code | Code Description | Reference |
|----------|--------------------------------------|----------------------------------|----------------------------|--|--------------------------|
| 90 | Police | 6 124 4 4 6 42 | 1 2 3 4 5 | Missing data Not specialized Incipient specialization Retainers of chiefs Military Specialized | Tuden and Marshall 1972 |
| 158.1 | Sum of cultural complexity (149–158) | | | Sum of scores for: Writing and Records, Fixity of Residence, Agriculture, Urbanization, Technological Specialization, Land Transport, Money, Density of Population, Political Integration, Social Stratification | Murdock and Provost 1973 |
| 200 | Region | 28 28 34 31 33 32 | 1 2 3 4 5 6 | Africa (Exclusive of Madagascar and the Sahara) Circum-Mediterranean (North Africa, Europe, Turkey, Caucasus, Semitic Near East) East Eurasia (including Madagascar and islands in Indian Ocean) Insular Pacific (including Australia, Indonesia, Formosa, Philippines) North America (indigenous societies to the Isthmus of Tehuantepec) South America (including Antilles, Yucatan, Central America) | Murdock 1962–1971 |
| 235 | Mean size of local communities | 38 31 29 24 17 | 1 2 3 4 | Missing data Fewer than 50 50–99 100–199 200–399 | Murdock 1962–1971 |

| | | | | | |
|-----|---|----|---|---|-----------------------|
| 237 | Jurisdictional hierarchy beyond local community | 12 | 5 | 400–1000 | Murdock 1962–1971 |
| | | 4 | 6 | 1,000 without any town of more than 5000 | |
| | | 10 | 7 | One or more towns of 5,000–50,000 | |
| | | 21 | 8 | One or more cities of more than 50,000 | |
| | | 2 | | Missing data | |
| | | 82 | 1 | No levels (no political authority beyond community) | |
| 238 | High gods | 48 | 2 | One level (e.g., petty chiefdoms) | Murdock 1962–1971 |
| | | 23 | 3 | Two levels (e.g., larger chiefdoms) | |
| | | 19 | 4 | Three levels (e.g., states) | |
| | | 12 | 5 | Four levels (e.g., large states) | |
| | | 18 | | Missing data | |
| | | 68 | 1 | Absent or not reported | |
| — | Mean of 6 main indices of internal conflict | 47 | 2 | Present but not active in human affairs | Roes and Raymond 2003 |
| | | 13 | 3 | Present and active in human affairs but not supportive of human morality | |
| | | 40 | 4 | Present, active, and specifically supportive of human morality | |
| | | | | Mean of six variables below (shaded) | |
| | | | | | |
| | | | | | |
| 666 | Moderate or frequent interpersonal violence† | 55 | | Missing data | Sanday 1981 |
| 767 | Conflict (social or political) in the local community | 43 | 1 | Absent | Ross 1983 |
| | | 88 | 2 | Present | |
| | | 96 | | Missing data | |
| | | 4 | 1 | Endemic: a reality of daily existence (e.g., physical violence, feuding, bitter factionalism) | |
| | | 20 | 2 | High: Conflict present but not a pervasive aspect of daily life | |

| SCCS No. | Variable | N | Code | Code Description | Reference |
|----------|---|-----|------|---|--------------|
| 768 | Conflict between communities of the same society | 46 | 3 | Moderate: Disagreements and differences do not result in high violence or severe disruption | Ross 1983 |
| | | 20 | 4 | Mild or rare | |
| | | 97 | | Missing data | |
| | | 25 | 1 | Endemic: High physical violence, feuding, and/or raiding occur regularly | |
| 770 | Resort to physical force by disputants in settling disputes, exclusive of police or institutionalized force | 23 | 2 | Moderately High: Often involving physical violence | Ross 1983 |
| | | 21 | 3 | Moderate: Disputes may occur regularly but tend to be managed in a more or less peaceful manner | |
| | | 20 | 4 | Mild or rare | |
| | | 96 | | Missing data | |
| 773 | Internal warfare (between communities of same society) | 34 | 1 | Often used | Ross 1983 |
| | | 32 | 2 | Sometimes used | |
| | | 24 | 3 | Rarely or never used | |
| | | 101 | | Missing data | |
| 891 | Frequency of internal war | 31 | 1 | Frequent, occurring at least yearly | Wheeler 1974 |
| | | 14 | 2 | Common, at least every five years | |
| | | 10 | 3 | Occasional, at least every generation | |
| | | 30 | 4 | Rare or never | |
| 891 | Frequency of internal war | 26 | | Missing Data | Wheeler 1974 |
| | | 17 | 1 | Continual | |
| | | 54 | 2 | Frequent | |
| | | 89 | 3 | Infrequent | |

| | | | | |
|-----|---|-----|---|------------|
| 713 | Religion | 93 | Missing data | Whyte 1978 |
| | | 14 | Preclassical | |
| | | 31 | Mixture of classical and preclassical | |
| | | 48 | Classical religion (Christianity, Islam, Hinduism, Buddhism) | |
| 775 | Compliance of individuals with community norms and decisions | 100 | Missing data | Ross 1983 |
| | | 43 | High | |
| | | 31 | Moderate | |
| | | 12 | Highly Variable | |
| 776 | Formal sanctions and enforcement for community decisions | 96 | Missing data | Ross 1983 |
| | | 23 | Great sanctioning power available | |
| | | 32 | Some | |
| | | 35 | Little or none | |
| 777 | Enforcement specialists (e.g., police, tax collectors) | 97 | Missing data | Ross 1983 |
| | | 29 | Present | |
| | | 21 | Not specialized but done by leaders who do other things as well | |
| | | 39 | Absent, or carried out by social pressure of wider community | |
| 784 | Taxation paid to community (e.g., in agricultural produce, labor, finished goods) | 101 | Missing data | Ross 1983 |
| | | 31 | Regular and non-negligible taxes to community | |
| | | 20 | Only in special situations or at a modest level | |
| | | 34 | None | |
| 778 | Loyalty to the local community | 103 | Missing data | Ross 1983 |
| | | 30 | Especially high | |
| | | 33 | High | |

| SCCS No. | Variable | N | Code | Code Description | Reference |
|----------|---|-----|------|---|-------------------------|
| 779 | Loyalty to the wider society (in some cases indistinguishable from the local community) | 14 | 3 | Moderate | Ross 1983 |
| | | 6 | 4 | Low | |
| | | 102 | | Missing data | |
| | | 11 | 1 | Especially high—uniformly high across groups | |
| | | 16 | 2 | High for the most part across groups in the society | |
| 1649 | Frequency of internal warfare (resolved rating) | 33 | 3 | Moderate—some noticeable variation across groups in society | Ember and Ember 1992 |
| | | 24 | 4 | Low—not terribly salient or rarely important as a concern | |
| | | 23 | 0 | No resolved rating (original code 0) [removed from analysis]‡ | |
| | | 60 | 1 | Internal warfare seems to be absent or rare (original code 1) | |
| | | 4 | 2 | original code 1.25 | |
| | | 5 | 3 | original code 1.5 | |
| | | 4 | 4 | original code 1.75 | |
| | | 7 | 5 | Internal warfare seems to occur once every 3 to 10 years (original code 2) | |
| | | 3 | 6 | original code 2.25 | |
| | | 5 | 7 | original code 2.5 | |
| | | 2 | 8 | original code 2.75 | |
| | | 4 | 9 | Internal warfare seems to occur once every 2 years (original code 3) | |
| | | 3 | 10 | original code 3.25 | |
| | | 6 | 11 | original code 3.5 | |
| | | 2 | 12 | original code 3.75 | |
| | | 8 | 13 | Internal warfare seems to occur every year, but usually only during a particular season (original code 4) | |
| | | 1 | 14 | original code 4.25 | |

| | | |
|------|--|--|
| 10 | 15 | original code 4.5 |
| 1 | 16 | original code 4.75 |
| 27 | 17 | Internal warfare seems to occur almost constantly and at any time of the year (original code 5) |
| 11 | 88 | Don't know or unclear (original code 8) [removed from analysis]‡ |
| 1718 | Sharing of food | Lang 1998 |
| 97 | Missing data | |
| 7 | 1 | Sharing of food among nuclear family |
| 14 | 2 | Sharing of food among kin residing in local community |
| 9 | 3 | Sharing of food among kin, not restricted to local community |
| 4 | 4 | Sharing of food among non-kin within local community |
| 21 | 5 | Sharing of food among all members of local community |
| 24 | 6 | Sharing of food among groups within unit of maximal political authority or ethnic group |
| 10 | 7 | Sharing of food among other than mentioned groups [removed from analysis]‡ |
| 1743 | Sanctions | Lang 1998 |
| 88 | Missing data | |
| 17 | 0 | No formal political office present (variable 1740 coded as 1) (original code 88) [removed from analysis]‡ |
| 26 | 1 | No or few means of coercion |
| 17 | 2 | Restricted means of coercion, e.g., only for certain types of decisions |
| 38 | 3 | Coercive means to enforce all decisions |
| 1748 | Frequency of internal warfare; i.e. between local communities within unit of maximal political authority | Lang 1998 |
| 96 | Missing data | |
| 51 | 0 | No political office above the level of the local community (variable 1740 coded as 1, 2, or 7) (original code 88) [removed from analysis]‡ |
| 15 | 1 | Rare or never |

| SCCS No. | Variable | N | Code | Code Description | Reference |
|----------|---|-----|------|--|-----------|
| 1749 | Frequency of internal warfare involving non-territorially organized groups within unit of maximal political authority | 11 | 2 | Occasional | Lang 1998 |
| | | 11 | 3 | Often | |
| | | 2 | 4 | Permanent | |
| | | 96 | | Missing data | |
| | | 51 | 0 | No political office above the level of the local community (variable 1740 coded as 1, 2, or 7) (original code 88) [removed from analysis] [‡] | |
| | | 20 | 1 | Rare or never | |
| | | 9 | 2 | Occasional | |
| | | 7 | 3 | Often | |
| | | 3 | 4 | Permanent | |
| | | | | | |
| 1750 | Frequency of violent conflict between groups within local communities | 114 | | Missing data | Lang 1998 |
| | | 51 | 1 | Rare or never | |
| | | 12 | 2 | Occasional | |
| | | 7 | 3 | Often | |
| | | 2 | 4 | Permanent | |
| | | | | | |

[†] These levels were reversed in constructing the mean, since this variable ranks violence in the opposite direction to the other five variables.

[‡] Coded values that do not represent any ordinal value were removed from all analyses.

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