We would like to submit “Cycles of Cooperation and Defection (and the Evolution of Beliefs in Supreme Beings concerned with Ethics).” A rough draft is attached. The three main sections of our article add historical and comparative context to Nowak’s discussion in your July cover article, Why We Help. It tells the story of early cooperativity among forager societies, its transformations through later historical dynamics, and its effects on religious beliefs. A summary through IN BRIEF bullets roughly corresponds to the article’s section headings:

1. Up-and-down cycles of cooperation and defection are not an invariant of human societies. (Cooperativity is a relative constant of migratory foragers described in ethnographies of the last four centuries and matched by archaeological inferences about foragers of the Late Paleolithic).
2. The up-down cycles of cooperation and Nowak’s “inevitable defection” mostly occur in limited contexts (i.e., in empires and other complex exchange societies with cycles of scarcity).
3. (We test the hypothesis that) As these up-down cycles intensify, with inequality rising during the down periods, a new type of ethical-preference belief arose and spread -- belief in an ethical Supreme Being who is concerned with human morality.

Section one provides summaries of rich and extremely well documented ethnographic data on 339 packed vs. nonpacked (high-density, settled vs. low-density, migratory) foraging societies and the archaeology of foragers going back to the Late Pleistocene period (65,000 – 12,000 BCE). It is essential to note that the data we summarize here were the results of 30 years of study by Lewis Binford, the most eminent 20th-century American archaeologist. He identifies the terrestrial “packing threshold” as a universal conditioner (2001:442-443: estimated at 9.1 persons per 100 km² for the migratory vs. settlement transition) “beyond which residential group mobility is no longer a viable strategy for insuring subsistence security from naturally distributed food resources.” We summarize from Binford the general features of nonpacked foragers, which, subject to terrestrial environmental adaptations, prove to be relatively constant in variants of social organization from the Late Pleistocene period to the ethnographies of the last four centuries. These data have not been previously reexamined in relation to the issues of modeling cooperativity as discussed by Nowak in his article, recent book, and elsewhere. Conclusions drawn from the various descriptive sections of our article provide far more positive views of early forms of human cooperation than those of continual evolutionary up-down cycles of cooperation and defection as emphasized by Nowak.

Sections two and three describe the cooperation and defection periods of the actual historical systems in which major boom and bust cycles are of such long duration as to be termed “secular” cycles, i.e., measured in centuries. They recur from the founding of empires through their displacement by others or other disruptive external conditions such as external wars. These cycles occur over four main periods: 1) innovation and population growth, 2) stagnation, 3) scarcity and conflict due to population outstripping resources, and 4) conflict and decline. We develop the hypothesis that a fundamental ethical preference is commonly expressed (e.g., belief in Supreme Beings concerned with human ethics) at the transition to a new type-1 period of innovation and growth, after one of type 4. Defections of cooperation increase when economic inequalities tend to be self-amplifying in the scarcity periods of secular cycles. We discuss the results of testing this hypothesis in section 3. New ethical-preference religious beliefs tend to arise and persist in a wide variety of more complex, settled, and contemporary societies, we argue, because of the constancy-of-cooperation heritage carried by the more egalitarian-ethos descendants of our nonpacked-forager Late Pleistocene ancestors.
Supplementary materials include the following 8 slides that help explain the various test variables for the section-3 model to determine when compensatory ethical preferences for a Supreme Being occur in terms of regressors predicting down-periods in secular cycles. We will provide a clickable slideshow to the SA photo editor, to be further edited for clarity and complemented by other supplementary materials.

**SUPPLEMENTARY MATERIALS**

1. All network variables: subtypes, correlates, controls, latent variables, direct and indirect regressors

2. Removed Islam and Christianity as types of HiGod4, not regressors.


4. Removed Missions and Logdate control variables: do not alter findings.

5. Removed Socplex, Plow, PCsize.2: correlated with HiGod4 but not regressors given other variables.


7: Removal of Frqintwar, Milk, Popdens, Ecorich: not regressors given other variables.

8: AnimXwealth, No_rain_Dry, FxMntyWages, SuperjhWriting, and Malthus latent regressor

**SUPREME BEING REGRESSORS**, eliminating subtypes, correlates, controls, latent variables, direct and indirect regressors

All terms to be defined, preferably in legend. More complete information on the Supplementary Materials are found at [http://intersci.ss.uci.edu/wiki/index.php/SciAm_Images](http://intersci.ss.uci.edu/wiki/index.php/SciAm_Images)
CYCLES OF COOPERATION AND DEFECTION AND THE EVOLUTION OF BELIEFS IN SUPREME BEINGS CONCERNED WITH ETHICS.

Douglas R. White, Giorgio Gosti, B. Tolga Oztan and John Snarey

1. Up-and-down cycles of cooperation and defection are not an invariant of human societies.
2. The up-down cycles of cooperation and ‘inevitable defection’ mostly occur in contexts of historical dynamics such as those of empires.
3. As these cycles intensify in the inequality of the down periods, there arise and spread beliefs in Supreme Beings concerned with human morality.

In the summary of his article, Why We Help (Scientific American, July 2012), Nowak concluded that “Evolutionary simulations indicate that cooperation is intrinsically unstable; periods of cooperative prosperity inevitably give way to defective doom. And yet the altruistic spirit always seems to rebuild itself; our moral compasses somehow realign. Cycles of cooperation and defection are visible in the ups and downs of human history, the political and financial systems.” To assess the validity of Nowak’s concluding statement, we examine the five mechanisms that he shows to underlie why humans cooperate: direct reciprocity (solutions to generalized Prisoner’s Dilemma), spatial selection (organization of life), kin selection (nepotism), indirect reciprocity (reputation), and group selection (the greater good). We contrast simpler and more complex types of societies to explore significant aspects of Nowak’s concluding statement. We aim to locate periods of stability and instability and hypotheses commensurate with these mechanisms of cooperation. Our approach to what can be learned from ethnographic and historical comparisons includes a social network perspective on when and where cooperation in human evolution has been most stable. The first section of this article gives ample evidence of stability of cooperation in forager societies and early Homo sapiens. How, in contrast, do populations respond that are subject to extreme down-periods in history? The second part of this article explores whether instabilities of cooperative economic defection relate mainly to cycles in periods of competing empires and long-range traders. In the third section we define regressors to test competing models for such effects. We find that periods of “defective doom” often show religious responses toward ethical preferences for a Supreme Deity that enforce human morality. We find that beliefs about Supreme Beings that embody concerns for ethical preferences do tend to arise and spread in response to the severe inequalities that emerge in downside periods within cycles of cooperative productivity versus defection. Specifically we find that these effects involve periods in which various kinds of scarcity-generated inequalities are produced in property and exchange systems. Our empirical results correspond to human demands to remedy avoidable extremes of inequality, i.e., to restore principles of fairness, established in human prehistory at the societal level, that are often violated in the down-periods of historical cycles. Our results shows that these episodes tend to occur not only in agrarian empires but also in the exchange systems of large pastoral regions.

Our results for complex societies fit Nowak’s first mechanism for explaining cooperation through a minimax game-theoretic model with an optimum joint benefit for cooperation. They contrast strongly with views promulgated in the current global financial industries—that humans are by nature selfish in a way that justifies misinterpreting “selfish genes” as “do harm unto others,” a Social Darwinist belief in selfishness rationalized by the “Invisible Hand” of the market, or that selfishness per se offers a selective advantage for human evolution or progress.
The Enron and many banking crimes of recent decades, plus incidents such as widespread scamming directed against religious and other groups, or the rise of powerful antidemocratic lobbies, are contrastive examples of some of the dynamics of struggle during and following periods of massive social imbalances and inequalities in complex sociopolitical systems. Our results support the overall modeling and experimental results on cooperation in Nowak’s 2012 article, as well as his 2012 book, *Super Cooperators*, but provide a more nuanced historical and sociological view of outcomes to the cooperation/defection problem in human evolution. Nowak’s perspectives, that is, do not identify the situations in which the minimax game-theoretic model with a cooperative joint optimum dilemma applies. Nor do they explain how to prevent the precipitating conditions of potentially massive “doomsday” defections in the down-periods of political and financial dynamics, including global-warming denial. Our modeling efforts and results may help provide a broader understanding of the issues, options, and role of beliefs in down-period dynamics, and the stakes involved in failure to regulate the ethics of markets.

**Up-down cycles of cooperation and defection are not an invariant characteristic of human societies**

There is little or no evidence that our Pleistocene ancestral species experienced up-down cycles of cooperation and defection in the period 65,000 – 12,000 BCE. Lewis Binford, the most eminent of 20th-century American archaeologists, identified “unpacked” foragers as people living below a threshold at which “residential group mobility is … a viable strategy for insuring subsistence security from naturally distributed food resources” (estimated at 9.1 persons per 100 km$^2$). “Packing” above this threshold results in a patterned decline in subsistence range resulting from a regional rise in population. The migratory “nonpacked” foragers have selfsimilar patterns of behavior when comparing archaic and more contemporary time periods, i.e., as between archaeological findings and ethnographies written over the past 400 years. Claire Porter and Frank Marlowe note, “It is frequently suggested that human foragers occupy ‘marginal’ habitats that are poor for human subsistence because the more productive habitats they used to occupy have been taken over by more powerful agriculturalists. This would make ethnographically described foragers a biased sample of the foragers who existed before agriculture and thus poor analogs of earlier foragers.” Porter and Marlow tested that assertion “using global remote sensing data to estimate habitat productivity for a representative sample of societies worldwide, as well as a warm-climate subsample more relevant for earlier periods of human evolution.” Their results show that “foraging societies worldwide do not inhabit significantly more marginal habitats than agriculturalists.” “Our results call into question the marginal habitat criticism so often made about foragers in the ethnographic record.”

Packing and other thresholds discovered by Binford are significant in and of themselves because they showed that among the more recent forager groups, environmental variables are the primary shapers of variation in social and ethnographic features, just as was true among past forager groups as shown by archaeological evidence. Binford was the world’s archaeological and comparative expert on nonpacked foragers and those beyond the 9.1-persons-per-100-km$^2$ packing threshold and described the general features of foragers from his thirty years of intensive study. It is only at or above the packing threshold that the many various forms of social organizational complexity appear. Some are apparent from archaeological findings of the Pleistocene period, but as shown by Stephen Shennan and many other archaeologists, these are rare bursts of complex organization and cultural creativity that fail to persist. Binford concludes that archaeological evidence about Pleistocene foragers is commensurate with a global
environmental (“terrestrial”) model of adaptations among nonpacked foragers.

Evolutionary biologist and comparativist Christopher Boehm also spent thirty years studying forager and nonstratified societies. He found that most foragers have, and nonpacked foragers almost invariably have, reverse dominance hierarchies. This is a widespread behavior pattern in which persons who attempt to dominate others, or dominate their groups, are punished by a variety of means that prevent their domination and often lead to killing or exclusion. In contrast, prestigious leaders emerge out of generosity and trust. In a game-theoretic framework, it is reputation and indirect reciprocity, Nowak’s fourth mechanism, not his first, that Boehm and Binford see as the engines of forager cooperation. This supports the intergenerational consistency of cooperation in the social networks described for nonpacked foragers as representative of our Late Pleistocene evolution. Periods of widespread defection from cooperative social norms are nowhere in evidence except for the necessity of restricting the broader forms of cooperation in periods of extreme scarcity when people are starving. There are no up-down cycles of cooperation and defection with a game-theoretic basis in the Prisoner’s Dilemma of the minimax optimum temptation to defect, that is, from a formerly cooperative partner, except under catastrophic environmental conditions. With this exception, foraging societies below the packing threshold of residential group mobility were very likely to have been immune from Nowak’s “ups and downs” of human cooperation. Judging from Binford’s reading and coding of all the high-quality ethnographies on 339 foraging societies (out of 399 total) in his magnum opus of 2001, this statement should hold both in ethnographic accounts of the last four centuries and in archaeological findings.

“Below the packing [settlement] threshold, hunter-gatherers are organized so that all participating individuals have maximal access to the [essential] vital resources that are accessible in their subsistence ranges. Participation in an economically integrated group means that all individuals endeavor to minimize the risk and maximize the return from cooperative labor that is directed toward obtaining the vital resources needed to sustain the group as a whole.” (p.469). This statement about nonpacked hunter-gatherers does not imply that equal rights are assured by the society. “Rather, in their social world, trust and respect are built upon the lifelong associations and interactions of individual members. Persons who are not considered trustworthy or ‘respectable’ by the community may be denied not only equal access to resources but even their very right to exist, which is hardly compatible with the idea of an egalitarian society in which all individuals have rights to the corporately shared largesse.” We learn from a social network viewpoint not only that “sharing is very common among hunter-gatherer groups that have not approached the packing threshold, as is the practice—when necessary—of using tools and supplies that belong to other persons,” but also that these are societies with “kin conventions extending food procurement rights to distant kinsmen,” rights that “tend to disappear” as mobility declines above the packing threshold. These networks persist intergenerationally, and relatively continuous cooperation was likely to have been part of the evolution of cooperation among nonpacked foragers.

Nowak’s first mechanism of cooperative solutions to the generalized Prisoner’s Dilemma (direct reciprocity) does not explain why cooperation in forager societies below the packing threshold was stable, and his fourth mechanism of reputation and indirect reciprocity reflects a particular network solution: that of food procurement rights to distant kinsmen along with stable cooperation. The latter network feature does not support the likelihood of Nowak’s second mechanism of cooperation, that of clustered spatial selection, due to the feature of distant marriages. Nowak’s third or fifth mechanism of cooperation through kin selection or group
selection, however, could easily occur among nonpacked foragers, but kin selection is invariably outweighed by non-kin cohesion in network demography, and group selection may be by-products of individual selection or levels of social cohesion rather than group extinctions due to intergroup conflicts. The latter is supported by Binford’s finding of adaptations to environment (games against nature), which might not promote social defection, barring environmental disasters. Even in a group that is progressively starving, nonpacked forager sharing will tend to retreat toward the smaller of concentric group sizes, e.g., band to family, and family to individuals. Different levels of social cooperation in prestate societies have been shown to be the key predictors of productivity (White 1969).

Instead of mechanisms dependent on forms and contexts of within-group competition, evolutionary simulations for foragers below the packing threshold may fall within the epistemic branch of game theory. This view differs from that of John von Neumann who introduced the concept in 1928 that cooperative games arise from coordinated behavior in non-cooperative games such as the Prisoner’s Dilemma. This is decidedly inappropriate for models of cooperation in nonpacked forager societies. Epistemic games, in contrast, are concerned with “the epistemology of games, which is the study of the role of the players’ beliefs, knowledge, etc. in games” (Brandenburger 2006:466). Given a community of mobile foragers with “a kin-based network of persons that is regularly maintained over a vast expanses of space” that “facilitate mobility, not for a ‘band’ but for the more fundamental units of the family or the individual,” as summarized by Binford (p.467), it is easy to see why children who were socialized through apprenticeships guided by parents and parents’ kin in different foraging environments would develop cognitively with a conception of self as similar to others rather than having dissimilar competing interests. Specializations in forager division of labor develop only after society attains or passes the packing threshold. The “episteme” among nonpacked foragers is one of belief in similarity and identification in social identities rather than in goal-dissimilar competition.

Following again Binford’s summaries, at or beyond the forager packing-threshold, as resources become scarce, “marriages between persons who share rights of residence to common territories become more common and … conventions restricting access to resources become more prevalent.” “A reduction in the scale and incidence of network-based exchanges usually occurs,” sometimes “accompanied by contemporary increases in short-distance, family-initiated trading expeditions, usually associated with the appearance of some form of money or with an increased investment of labor in the production of craft items [in exchange] for food” (p.469). “Longer term patron-client relationships of exchange … represent the next most common new form of exchange and circulation relationship appearing at and immediately following packing” (p.470). Nonetheless, “generic hunter-gatherers do not give up an egalitarian way of life,” although nonegalitarian relationships in subsistence security result from habitat patchiness in a regional structure. And “once hunter-gatherer populations in a region crossed the packing threshold, a vast amount of variability appeared rather suddenly, associated with a high rate of systemic extinction” (p.469).

The Late Paleolithic phase of cooperation among nonpacked foragers is a potential exemplar of an evolutionary epistemic-gaming model, one of forager egalitarianism (as opposed to equality) of exchange and of interdependence relations in a spatially diffuse network formed primarily by chains of strong ties. Here, cooperation is based on indirect reciprocity and easily emulated reputations. Exchange is either by gift giving through long-distance kinship ties or through trading partnerships between individuals or families that are not based on kinship (p.469). Would-be dominators (over groups, network focal points, or relationships) are
systematically punished, as shown by Boehm (1993, 2012). This aspect of an egalitarian ethos carries over into a great variety of social forms in today’s world, coexisting with bullying.

The patterns of behavior laid down in the Pleistocene period are those of intra-societal social mechanisms for conflict resolution and relatively stable cooperation. Fights and wars between groups do occur, especially among foragers with aquatic resources. In such societies, in which shoreline territories are privileged, population density is supported by nucleation of resources, and transitions to forager packing occurs more frequently, leading to higher levels of social complexity and warfare. Such wars rarely occur with the goal of conquest, extinction of enemies, or control and dominance over the flows of exchange. Instead, more generally, extensive flows of exchange are part of the diffuse and extended networks and norms of cooperative behavior.

**Historical contexts of up and down cycles of cooperation and “inevitable” defection**

Repeated cycles of growth and decline are as old as written history. Those that affect changes from massive cooperation to massive defection have come to be recognized by their distinctive “secular” temporal signature, associated with rises and falls over more than a century in the cycles of empires. The early part of the cycle represents economic development and territorial expansion, with competition both in international trade and military/political dominance. Several empires are usually in competition within the same region, often entailing military competition and state building for greater mobilization of military conscriptions. Secular cycles rarely continue, however, beyond four up-down cycles of initial recurrent oscillations, sometimes interrupted by external wars. With great distances but open trade routes between empires, as between the Ming Dynasty in China and more westerly empires, a more isolated imperial capital is less concerned with military mobilization, and commercial traders can flourish along the margins of distant trade routes, as with the Silk Route. The invention of national markets and currency that occurred in Ming China is one growth and innovation period in a secular cycle of empire when long-distance trade stimulated economic development between trade partners in Europe and West Asia. Empires compete with new and prior empires near and distant in their longer periods of ascending and descending dominance. As trade velocities and total trade increase on average, over time, cycling periods shorten, and the average depth of the downside crashes increases.

The internal dynamics of state-based economic systems within empires are dependent on taxes and, as foreign trade increases, on commercial economies in which payment of wages becomes more prevalent. This creates the likelihood that up-down cycles will produce greater inequality on the downside of their secular cycles because population increase relative to food sources, characteristic of secular cycle crises, creates scarcity. Overpopulation with scarce resources diminishes the competitive wages of laborers, whereas scarcity increases the value of property, amplifying the advantages to owners of property relative to laborers. This advantage can augment over successive cycles, with amplification of conflicts and inequalities until the perception of social equity by the bulk of a population becomes unsustainable. These are “self-amplifying” down-cycles. The greatest source of “massive defection” perceived in the late conflict-decline period of secular cycles is probably the breaking of the social contract that occurs with self-amplifying inequality. The current global collapse is a good example, one caused by downside periods of the secular cycles of core states and large-scale political entities (not only empires, e.g., the European Union, US, and China).

Given the existence of periods of “massive defection” following the late conflict-decline periods of secular cycles, periods in which major self-amplifying inequalities—given the
egalitarian basis of early human evolution— would be perceived as the breaking of the social contract, the question that we investigate here is whether changes in societies affected by these phases of secular cycles (not just empires themselves but societies affected by secular cycles within the territories of empires) would not affect the populations’ ethical preferences for adoption of beliefs in more powerful Supreme Beings with concerns for ethics. In part 3 we test this hypothesis.

**The spread of beliefs in Supreme Beings with ethical concerns for humanity**

We test here the hypothesis that it is following down-periods of self-amplified secular cycles—with perceptions of unacceptable inequalities from a preceding period but now one of peace, innovation, and potential growth of population and resources—that new “ethical preference” religious beliefs are likely to be accepted that entail a Supreme Being with potentially unifying moral concerns for humanity. The time of Mohammed, as described by Turchin in his chapter, Asabiya in the Desert (War & Peace & War) was one that fits the hypothesis perfectly. The concept of Asabiya in Arabic, meaning cohesive solidarity, is central to Ibn Khaldun’s 14th century theory of cycles in history, including periods in which religious reformers reestablish Islam after periods of urban corruption and dissolution. The Supreme God religions, like Judaism, Christianity and Islam, and their latter-day derivations, get adopted again and again in communities that reside within empires and/or are affected by their more extreme down-cycles. We test the Supreme Being hypothesis with the 186 society Standard Cross-Cultural Sample (SCCS), which is fully coded (by Snarey) for beliefs in Supreme Beings with ethical concerns for humanity. The “High Gods” variable for religious beliefs (first defined by Swanson 1960) is coded as: 1 = None, 2 = Unconcerned with human affairs, 3 = Unsupportive of human morality, and 4 = Concerned with and supportive of human morality. The SCCS is also coded for world religion and proselytization. Many of the SCCS societies are largely Christian or Muslim; one is Judaic, and nine others are also in category 4, i.e., “Moral Gods” religions but not major world religions. The Ancient Hebrew Kingdom of Judah as of 621 BCE (pinpoint date for Promulgation of Deuteronomic laws), a society undergoing religious reform under King Josiah at a time when the Kingdom of Judah was briefly free from domination by Egypt from the southwest and by successive empires of Assyria and Babylon from the east, also fits the hypothesis. (While Palestine at the time of Christ and Israel during the time of Moses also fit the hypothesis, they are not included in the sample).

Islam and Judaism also represent another phenomenon in some of the SCCS societies, in which the spread of Moral God religion is hypothesized as occurring more frequently following periods of extreme stress not following the down-periods of extreme stress within empires but those of extreme dryness that threaten the existence of pastoral societies using camels and horses in long-distance trade. The latter societies have exchange systems that involve bridewealth payments and brides as a source of wealth in mothers’ fertility wherein rights are acquired to retain children whose patrilineages constitute both the property-owning elites as well as those with lower right-acquisition payments (bridewealth) whose offspring are more likely to become laborers. In these cases, after pastoral societies experience scarcities and strife among lineages, with extreme inequalities between them and in extreme secular-cycle down-periods, it is often the adoption or restoration of religious support of principles of fairness that help re-knit the torn fabrics of the social order.

We tested this theory by constructing appropriate independent variables, with High Gods (coded 1 to 4, with 4 as Moral God Supreme-Being beliefs) as the dependent variable. The core
independent variables were named AnimXbwealth (bridewealth present along with 70% or more
dependence on pastoralism, which invariably includes camel and horse herds), No_rain_Dry
(ethnographer and regional reports of Low rain and a Dry ecozone), SuperjhWriting (Levels of
jurisdictional hierarchy and Writing, an element in tax collection), and FxCmtyWages (Fixed
Communities with labor for Wages). As detailed in the Supplementary Materials, the regression
model included correction for Galton’s problem (WXhat as a regressor controlling for distance
and language autocorrelation), missing data estimation (from the significant principal
components of fully coded auxiliary subset of the database that is uniform for all model-testing
with the SCCS), and Hausman tests for exogeneity, as to whether the error terms ε in the fitted
model in eqn. (1) were uncorrelated with the independent variables, including WXhat. The final
variables with missing data estimates were analyzed using Bayesian MCMC regress followed by
BayesFactors comparisons of models with one variable deleted at a time from the original model.
This produced an understanding that the two variables for features of membership in political
empires (SuperjhWriting and FxCmtyWages) were colinear, and together formed a measure of
potential self-amplifying social status disparity in times of scarcity. In the final model, the new
variable of SuperjhWages substituted for these two latter variables as their product.

\[
\text{High God} = WXhat + SuperjhWages + No\text{_rain}_\text{Dry} + \text{AnimXbwealth} + \varepsilon
\]  

(1)

This regression model proved to be exogenous, also significantly lacking type I (null
hypothesis) and type II error (departure from fit of all variables to the model), and with a
magnitude of fit \(R^2 = 0.36\), considered sizeable in cross-cultural research given the ranges of
reliabilities of ethnographer statements and of coder judgments. Adjustments for sources of
potential bias were considered in further analysis of this model as against other models for our
dependent variable. Results, including the finding that No_rain_Dry was a regressor of the
pastoralist regressor (AnimXbwealth) on the dependent variable, are shown in the diagram of
Model 1. To summarize, Model 1 evolved from a series of regressors hypothesized to affect the
likelihood of producing self-amplifying inequalities in times of scarcity, whether in the exchange
economy of a large pastoral-society region (with camels and horses used in trade and bridewealth
acquisition of brides to replenish wealth-owning or wage-labor patrilineages; also with scarcity
of water) or in an agrarian region of empires with wages, fixed communities, property
ownership, and states with tax collection and writing. Effects of these variables are shown with
the solid arrows in the diagram below. The “Malthus event” of overpopulation relative to
resources is a regressor measured by a first principal component for the agrarian variables.
Adding an Islamic conquest variable improves \(R^2\) but does not alter other effects in the model.
A better understanding of this model was obtained by comparing it to a previous model by Brown and Eff (2010) that used all the same regression procedures except for MCMC regression and BayesFactor tests for type II error. That model did not take our hypothesis or its hybrid variables into account. When we treated each of our model’s variables as dependent on the variables of the other study, or vice versa, the resultant network of variables showed multiple layers of directed relationships as shown below in Model 2 (red lines here represent negative effects of regressors). The overall directedness of the acyclic graphs for Models 1 and 2 results not from an assumption about the necessary structure of the graph but is a finding of the regression analysis aided by Bayesian prior beliefs about potential causation. The linked regressions, that is, could have generated cycles but did not.

A variety of other variables were considered and are discussed in Supplementary Materials: they include the Moslem and Christian subtypes of HiGod4, correlates, and controls for missing data estimation and confounding effects such as missionary proselytization and time periods of ethnographic observation. Overall, results supported causal interpretations that are not cyclical. This reinforced our view that we had discovered the more direct effects of cross-cultural variables on the spread of Supreme Beings as a source of beliefs in ethical principles following recovery from down-cycles.

Towards All for One and One for All

We have argued from a number of prior studies that boom and bust cycles of cooperation and defection occur at the level of those political systems that grew into empires or large-scale pastoral exchange systems, bent on enjoying the benefits of expansion, conquest, and control of strategic benefits of exchange. In an inventory of world empires, all exhibited at least four secular up-down periods. What our findings indicate about the rise or spread of religious beliefs in Supreme Beings with concerns for human ethics is that they recur in societies that are affected by the hybrid variables that we defined specifically to measure the likely effects on local societies of up-down cycles given their locations within large spheres of exchange and economic competition, and the “winner-take-all” dynamics of down periods caused by empire-scale population growth that outstrips resources within these spheres. These include as predictors those
socioeconomic indicators at the local level for which the dynamics of increasing plentitude of people depresses wages, and the scarcity of resources raises the value of property, creating self-amplifying inequalities in down periods. This is not only an historically archaic problem, but also a problem of today that affects our collective futures. The contemporary notion that the “selfish gene” establishes a natural order for institutional arrangements is itself part of the cycling of beliefs in up-down cycles. Notions of Supreme Beings with concerns for ethics are in part responses to the downside of these cycles. The human inheritance—our moral, intellectual and behavioral norms as established by nonpacked migratory foragers in the Late Pleistocene period—is still a fundamental component of how we deal with these cycles and is still very much in play.

We of course welcome the more expansive view of cooperation in Nowak’s latest book and his treatment of the deficiencies of various forms of punishments thought to enhance cooperation. Ours is not a critique of Nowak’s five principles but a clarification of where cycles of defection apply or do not apply and the significance of understanding the forms of cooperation that do apply for the nonpacked forager societies. The bedrock of those beliefs in the value of cooperation are the grist of our human ancestry that, along with an understanding of the evolutionary emergence of ethical beliefs in High God religions, provide a more benign understanding of human cooperation than the Social Darwinism that has become so prevalent in the international up-down cycles of today.

Nowak noted in his July article that “Cycles of cooperation and defection are visible in the ups and downs of human history. Where we are in this cycle right now is uncertain, but … policy makers should take note of indirect reciprocity and the importance of information and reputation in keeping defectors in check.” The results of our hypothesis testing, that the spreading of religious beliefs in Supreme Beings with concerns with human ethics follows massive down-swing periods in historical cycles of cooperation, lends credence to the view that these events are not regarded as natural by ordinary members of these societies but as violations of fundamental moral and ethical values that originated in early Human—Homo Sapiens sapiens—evolution.

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John Snarey is a professor of human development & ethics at Emory. Two of the variables for our core Supreme Being model were coded in his 1996 The natural environment’s impact upon religious ethics.

More to explore


Erasable Notes for the Editor

The Historical Dynamics Working Group meetings of the authors were funded by the Santa Fe Institute. The supplement to a companion article by White, Oztan, Giosti, Wagner and Snarey, 2011 has the R code referenced for the model testing associated with results in Figure 2. The R code will be provided in Supplementary Materials. Strikethroughs show where pages numbers from references cited can be eliminated. Contributions of the authors: White did the major draft, Snarey contributed a complete independent coding of the High God variables, rainfall as reported by the ethnographers (Lo_Rain variable), and the control variable of missionization, which did not affect the Moral God results. Giosti and Oztan contributed to elements of the R scripts for the Moral God model and to an early draft describing model results. The preprint to this article has a full sequence of publications as referenced below.

See Nowak reference to
http://www.scientificamerican.com/jul2012/cooperation

Lending a Helping Paw: When Animals Cooperate [Slide Show]  
Humans are not alone in aiding others
By Kate Wong | June 19, 2012

What is planned beyond Model 1 and 2 Diagrams are six additional diagrams to complete a clickable slide-show (like the url that Nowak used) that peels back the labels of the network graphic: Islam and Christianity peel off first, then the control variables that don’t affect the core of the model, then variables that have no indirect effect, like evil eye beliefs and a few others, then the variables that have only indirect effects, then the pair of remaining independent variables that don’t pass MCMC BayesFactors (type II model fitting error) as having separate effects, then the final remaining variables where the last two are best treated as having a multiplicative effect. That slide show (each slide with text underneath), along with a few additional items for remaining explanations needed, will serve as the supplementary material.