

Following the submission of a Matters Arising article concerning the analysis of missing values in the data of another research group, the publication of this paper in *Nature* was retracted in July 2021. Please refer to the below link for details.

<https://www.nature.com/articles/s41586-021-03656-3>

A revised version of this paper was published in *Religion, Brain & Behavior* in June 2022. Please refer to the link below for more details.

<https://www.tandfonline.com/doi/full/10.1080/2153599X.2022.2074085>

Press Release



Keio University

March 22, 2019
Keio University

Big data reveals coevolution of religion and society over 10,000 years of world history

—Religious beliefs are a consequence, not a cause, of the evolution of large-scale societies—

An international group of scholars, including co-first author Associate Professor Patrick Savage of Keio University, published a foundational paper in the journal *Nature* based on the Seshat: Global History Databank, founded by Professor Peter Turchin of the University of Connecticut and Professors Harvey Whitehouse and Pieter François of the University of Oxford. The team established the first global database of human history and used it to test competing theories of why humans evolved to cooperate in large-scale societies. The results contradicted prevailing theories by showing that beliefs in gods who punish moral violations are a consequence, not a cause, of the evolution of complex societies.

Instead, the research found that standardized religious rituals appeared much earlier than beliefs in moralizing gods (*1), suggesting that collective identities are more important than religious beliefs for facilitating cooperation.

This research—a collaboration between anthropologists, historians, archaeologists, mathematicians, computer scientists, and evolutionary scientists—shows how “big data” can revolutionize the study of human history.

1. Main Points of Research

- Creation of an open-access database containing over 200,000 records from over 400 societies spanning 10,000 years of world history.
- Overturning existing theories by revealing that religious beliefs in gods who punish moral violations are a consequence, not a cause, of the evolution of complex societies.

2. Background of Research

Why have humans, unlike other animals, evolved to cooperate in large groups of unrelated individuals, as we do in today’s modern nation-states? For centuries, researchers have debated the causal role of religion, agriculture, warfare, and other potential factors. One prominent

“moralizing gods” hypothesis proposes that religious beliefs were a key factor because people are more likely to cooperate fairly if they believe gods will punish them if they don’t. But in the absence of standardized quantitative data from throughout world history, it has been impossible to distinguish between cause and effect in such theories.

To address this problem, this research group created the Seshat: Global History Databank in 2011. Seshat integrates the expertise of anthropologists, historians, archaeologists, and scientists into a state-of-the-art, open-access database with a user-friendly interface, available at <http://seshatdatabank.info/data>.

3. Content of Research and Results

The research group worked with dozens of regional experts throughout the world to assemble detailed data on social complexity (*2) and religious beliefs and practices from 414 polities (independent political units) (*3) from 30 world regions over the past 10,000 years of world history. Social complexity data included estimates of things like population size, territory area, levels of government, and presence of writing, while religious data included the presence of beliefs in supernatural enforcement of reciprocity, fairness, and loyalty, and the frequency and standardization of religious rituals (*4).

The researchers performed a variety of statistical analyses including principal component analysis, logistic regression, and time-series analysis, to test the moralizing gods hypothesis in a way that controlled for historical relationships among the societies and uncertainty in the historical and archaeological data. Surprisingly, the data strongly contradicted the predictions of the moralizing gods hypothesis: in almost every world region for which data were available, moralizing gods tended to *follow*, not precede, increases in social complexity. Furthermore, standardized rituals tended on average to appear hundreds of years before moralizing gods, suggesting that collective identities are more important than religious beliefs for facilitating cooperation.

4. Future Developments

This research shows that it is possible to synthesize global data on world history to resolve longstanding disputes about general patterns in world history. The researchers now plan to apply these powerful new tools to other theories that have been proposed involving such domains as agriculture and warfare.

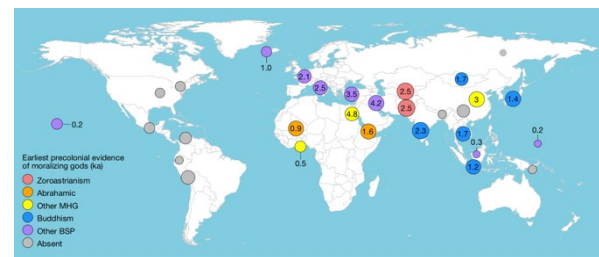


Figure 1. The global distribution and timing of beliefs in moralizing gods.

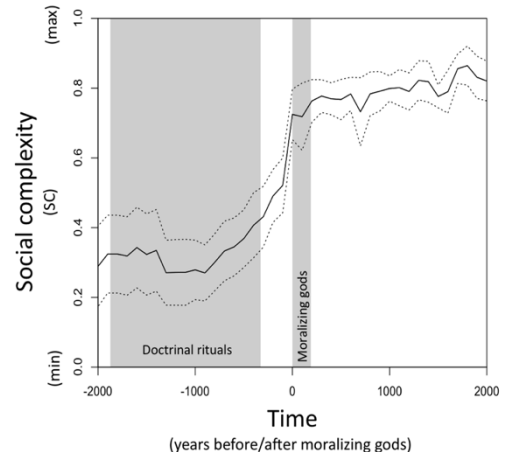


Figure 2. Social complexity tends to increase more rapidly *before* the appearance of moralizing gods, not after.

<Details of Original Paper >

Title: Complex societies precede moralizing gods throughout world history

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<Glossary >

- *1 Moralizing gods: Supernatural agents believed to punish humans for violations of interpersonal morality (e.g., for cheating, lying, or being disloyal). These include “moralizing high gods” like the Abrahamic God of Judaism, Islam, and Christianity, as well as “broad supernatural punishment” as found in concepts such as the *karma* system of Buddhism.
- *2 Social complexity: A composite measure of how complex societies are that combines aspects of population, government, infrastructure, and other proxies.
- *3 Polity: An independent political unit that ranges in scale from villages (local communities) through simple and complex chiefdoms to states and empires. What distinguishes a polity from other human groupings and organizations is that it is politically independent of any overarching authority; it possesses sovereignty.
- *4 Doctrinal rituals: Standardized rituals that occur frequently (daily/weekly) and/or are administered by multiple levels of religious hierarchy (e.g., senior priests, High Druids).

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