

## RETRACTION

*The Executive Board of História da Historiografia communicates the formal retraction of the article below due to plagiarism:*

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*This retraction was requested both by the author Thales Silva and by the authors Aleš Chalupa and Tomáš Hampejs. The author Thales Silva claims that he based his writing on old annotations of the plagiarized article and that he thought he had made the necessary adjustments in order to ensure the trustworthiness and integrity of the information. On the other hand, the authors Aleš Chalupa and Tomáš Hampejs claim that this is not the first time that they have their article plagiarized by Thales Silva.*

*HAMPEJS, Tomáš; CHALUPA, Aleš. Formalizující modelování v neintencionální historii náboženství: Transdisciplinarita mezi přírodní vědou a historickou religionistikou? Religio: Revue pro religionistiku, v. 26, n. 2, p. 99-132, 2018. <http://hdl.handle.net/11222.digilib/138911>*

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Editor in chief*

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RETRACTED  
ARTICLE

Complexity theory and the historical study of religion:  
navigating the transdisciplinary space between the  
Humanities and the Natural Sciences

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## ABSTRACT

This article advocates for a set of recent transdisciplinary options for the History of Religion, combining methods from the Natural and Human Sciences, through a special focus on the study of so-called “complex systems”. We elucidate their theoretical bases and limitations while assuming a pragmatic positioning between a defense of the historical-scientific study of religion and the promotion of groundbreaking methodological outlooks emerging from the Digital Humanities. From this background, throughout the text, we argue for a complementation of historiographical “close reading” with both “distant reading” techniques and interdisciplinary research, using computer-based methods and a diversity of formal modeling techniques. In short, we conclude that such methods offer novel ways for data representation and are best understood not only as creative schemes for solving issues in historiography, but also as a springboard for new inquiries arising from the transdisciplinarity between the Humanities and the Natural Sciences.

## KEYWORDS

Interdisciplinarity. Methodology. Digital Humanities.

## Introduction

The cornerstone of Religious Studies as the academic study of so-called “religious phenomena” is the systematic and critical processing of historical and ethnographic evidences of religious belief and behavior. From this empirically led description, it might seem the field deals with something fixed and that, for its critical processing, a rigorous organization of the target-material according to its natural properties would suffice. However, few readings can be naiver and more misleading than such definition of the discipline’s epistemic work. For the history of Religious Studies could be told as a periodic dispute on how to problematize “religion” and most of the other core concepts contained in such interpretation.<sup>1</sup> With these observations in mind, this theoretical and methodological study also wants to be included in this sort of long-established critical-reflective contribution to the field. Its immediate context is the present-day discussions on the status of evidences in the academic study of religious beliefs and behaviors, conducted mainly inside the recent influx of scholarly reflections on the interdisciplinary program known as Cognitive Science of Religion (CSR).<sup>2</sup> Here, our starting point is a kind of constructive critical current that has become an intrinsic part of these discussions, challenging the CSR scholars’ tendency to neglect studies with historical data and to marginalize conventional Humanities expertise. Given this background, this article aims to take a pragmatic and reasonable intermediate position between a programmatic and normative provocation and a practical evaluation of a specific methodological orientation: the possible utility of modeling and formalization techniques for historically grounded research on religion.

That being said, this study has two main goals. First, to outline a number of selected features that are part of the often-ignored transdisciplinary space<sup>3</sup> between the (evolutionary) cognitive sciences and the historical study of religion, and in a broader sense between the Natural Sciences and the Humanities. Such space has, most recently, been greatly explored by a set of methodological positions and practices, which in this article are illustrated by the (aforementioned) usefulness of what is known as “modeling and formalization”. Logically, these concepts have their own independent

<sup>1</sup> Cf. AMBASCIANO, 2018.

<sup>2</sup> As an explanatory research program, CSR seeks and is characterized by naturalistic explanations of religious phenomena, based on the search for their contextual mechanisms as opposed to universally operating laws (MCCAULEY; LAWSON, 2017, p. 6-7).

<sup>3</sup> A situation where mutually beneficial interdisciplinary interactions refer to problems that appear to transcend the interacting fields themselves, or produce results that transcend them – being linked to how the disciplinary boundaries involved are defined.

history, but recent developments<sup>4</sup> have contributed to their merging and crystallization as a collective working title for a particular group of formal models<sup>5</sup> and the means (techniques and processes) to establish them. Here, the term “formalization” is used to the detriment of the adjective “formal,” in order to emphasize its meaning as a “process or activity striving for formality”<sup>6</sup> (the pursuit of a rigorous position in relation to a formal reference system of representation) over, and as opposed to, a “final state of formality”.<sup>7</sup>

Secondly, we want to synthetically apprehend some main contemporary epistemological discussions on combining the expertise of the Natural Sciences and the Humanities, implicitly mediating several case studies from the exploration of this transdisciplinary space – the majority of which, working with the prospects and current reception of the Digital Humanities in the historical study of religion. Therefore, in reaffirming their goals, even though only by mentioning them and theorizing from their conclusions, we are convinced these technologies can lead to a fundamental and useful transformation of the academic work with historical documents, theories and the construction of critical statements about religious phenomena, while fully preserving the Humanities expertise – and the knowledge thus created can better participate in consensual conversations linking History and the Natural Sciences.<sup>8</sup>

### From formally defining to modeling (in silicio)

Given their subject of study, Religious Studies scholars who reject any essentialist conception of “religion” would probably agree with the definition of their subject as the academic study of those distinct beliefs and behaviors that could be described as religious. Obviously, although this epistemological orientation is considerably widespread among

<sup>4</sup> Coming from a considerably wide historiographical and religious studies crowd, particularly through a methodological orientation strongly connected with digital technologies, offering a commentary on potential innovations for the historical study of religion.

<sup>5</sup> Useful research and presentation constructs that transcend or leave the boundaries of human natural language, i.e., logical/mathematical expressions, computational models, visual graphs, tables, and maps.

<sup>6</sup> Clearly, useful models can also be hybrid, i.e., containing both elements of a formal system and human natural language sentences.

<sup>7</sup> Modeling and formalization are creative and imaginative processes, whose purpose is pragmatic, not normative: to look for a new transparent and useful perspective for a phenomenon or its documents, and not just to work through one selected formal system.

<sup>8</sup> An illustrative example of this type of approach is the “Consilience” project, which strives for the academic integration of knowledge coming from both the Humanities and the Natural Sciences (Cf. SLINGERLAND; COLLARD, 2012; BULBULIA; SLINGERLAND, 2012).

researchers today,<sup>9</sup> one must admit that such perspective is directly connected with certain implicit assumptions and, as such, has its own perils – for example, in the form of an ontological emphasis on the role of the individual (who thinks, acts and exhibits certain behaviors) over the whole (whose ontic status is often unclear). However, even those scholars who reject essentialist conceptions of “religion”, especially those coming from historiographical backgrounds, encounter in their work documents homogeneously and monolithically referring to collective patterns of religious actions and thoughts. This tension between the individual and the collective (and between the empirically concrete and generalized abstractions) represents an epistemological challenge for any theory working with complex human constructs, as illustrated by the aforementioned troubled history of the academic concept of “religion”.

Curiously, this is something that could also be applied to most of early scholarship in CSR, which, in its inception, assumed that it would be sufficient to base the ontology of its target-phenomenon on the psychic reality of the individual – causally subordinating everything social and cultural to it.<sup>10</sup> However, in a change of attitude primarily motivated by historiographical expertise, such position was almost immediately followed by a scholarly effort to think about, reinforce, and defend the mutual causality between culture and cognition in all the academic study of religious beliefs and behaviors.<sup>11</sup> In this context, religion, like an “airy nothing” (BOYER, 2001, p. 2-4), once escorted out of Academia through methodological naturalism and individualism, started to imaginatively return as a synthetic category of apparently unreducible bio-cultural complexity.<sup>12</sup>

Historically, though, this tension had already received a well-known conservative solution, one that emphasized the analytical responsibilities of the researcher. The American historian Jonathan Z. Smith (1938-2017), for example, formulated upon such ideas when he reminded us that, in the context of its academic study, the concept of “religion” is (virtually) always a tool that primarily reflects the interests of particular authors (SMITH, 1982, p. xi). This epistemological attitude, emphasizing the pragmatic value of conceptual categories instead of their condition as some sort of truth, was more recently reflected in the observations of another historian, Thomas A. Tweed, who, based on the analysis of various classical

<sup>9</sup> It must be emphasized that, historically, this was not (and still is not) always the case, Cf. FRANEK, 2020.

<sup>10</sup> Cf. MARTIN, WIEBE, 2017.

<sup>11</sup> For a critical overview of the “historical blindness” in CSR, Cf. AMBASCIANO; COLEMAN, 2019.

<sup>12</sup> Cf. GEERTZ, 2010.

definitions of “religion”, described over a dozen orienting metaphors (e.g. mental dispositions, faith, experience, system, worldview, institution), each of which capable of establishing a number of theoretical conceptions and categorical models by itself (TWEED, 2006, p. 48-53).

Thus, in a way, it might seem that, in the academic study of so-called “religious phenomena”, striving for modeling and formalizing “religion” is *sensu lato* something far from innovative. Both Tweed and Smith, however, did not call their analytical patterns “models”, because they were more concerned with theoretical definitions than research methods, and were primarily interested in metaphors as orienting tools for academic thinking – developed through our “folk” natural language. Therefore, the main axis of this study can be grasped in contrast, but also in parallel, with both of these goals, since “modeling and formalization” are, once again, understood here as representing a methodological position that stresses the “process” rather than the “results” of the research work – especially through an emphasis on a transformative and transparent manipulation of assumptions and records *in silicio* (using representational technologies)<sup>13</sup>, a procedure that tends to directly force the application of formalization patterns that are outside of the scope of human natural language. As we understand them, these technologies are primarily mathematical and computational tools already been used by the Natural and Social Sciences in the study of phenomena known as “complex systems”.<sup>14</sup> At the same time, our argument proceeds in a similar direction to Tweed’s, since, when explaining what is commonly treated as “religious”, we want to emphasize the study of processual circumstances similar to those explicitly referred in the title of his monograph (*crossing and dwelling*).

## Working with complex systems

Presumably, very few historians would oppose to the description of the subjects of their study as complex phenomena, and not only because this perspective has become a natural stance against the polemical threat of a possible unwanted reduction<sup>15</sup>

<sup>13</sup> I.e., digital technologies that allow a target-phenomenon to be represented (captured, preserved, mediated) in its specificities. This concept is becoming increasingly common in monographs on computational modeling (WILENSKY; RAND, 2015, p. 1).

<sup>14</sup> Cf. MITTAL; DIALLO; TOLK, 2018.

<sup>15</sup> However, this stance is philosophically incoherent, as “all theories and explanations are reductionist from some point of view. It is the *explanandum* in question that determines at which level of analysis we seek for answers” (WATTS; TURNER, 2014, p. 31).



(BLUM, 2018, p. 167-205). When modeling and formalizing, though, the adjective “complex” is used in a sense that, although shares a similar emphasis on context and comprehensiveness to that presented in the Humanities discourse, directs these concerns to the structurally science-oriented epistemological position of so-called “complexity science” or “complexity theory”.<sup>16</sup> Through reintegration, this perspective seeks to resolve the discrepancy between apparently irreducible wholes, with unclear ontologies (e.g. cultures or religious traditions), and the sometimes inevitable need for their methodological reduction into parts (e.g. biases on information transmission or psychological mechanisms) often studied in isolation and with difficult-to-grasp relationships to the aforementioned wholes. Such position is often characterized by a sort of holistic grasp of reality, which is achieved through thinking about wholes and parts as systems of mutual functional and causal dependencies: the focus of the research is, thus, collective patterns (or their models) conceived as systems, i.e., integrated units of interacting and interdependent pieces, and the processes governing their change (dynamics). In this context, the “complex” attribute is then given to those systems that exhibit so-called “complex behavior”, i.e., self-organization (achievement of order without an external central cause), nonlinear dynamics (presence of feedback mechanisms causing a nonlinear course of change), and emergence (the whole possesses, through internal interactions, emergent observable properties that do not seem to result from the operation of its parts).

Academically, the study of complex phenomena is largely linked to an effort to focus not only on the objects and structures themselves, but also on the relationships and processes that shape them (internally or not) and, thus, to predict, for example, their observable behavior. As previously mentioned, in the Natural Sciences these phenomena are usually associated with formal modeling techniques using mathematical (differential equations) and computational tools, such as agent-based modeling (ABM) – although the main epistemological insights coming from their study have shown to be (also) useful for qualitatively-oriented field research (BERGENDORFF, 2009, p. 83-144). Naturally, the consideration of a certain autonomy of the wholes (e.g., in the form of a culture or society) is nothing revealing for most of the Human and Social Sciences, given that what is popularly treated as the “social” forms the traditional basis of their target-subject. However, in the study of complex systems, this epistemological position is often associated not only with the effort to grasp phenomena holistically, but also with an endeavor to include them in a larger corpus of formal scientific knowledge – being,

<sup>16</sup> Cf. BERGENDORFF, 2009. An increasingly large number of projects calling for a fundamental rethinking of the scientific understanding of reality and its complexity, including studies in the Humanities, Natural and Social Sciences (Cf. BERGENDORFF, 2009; JÖRG, 2011).

therefore, consistent and even part of projects that seek to link distinct organizational and disciplinary levels of naturalistic expertise (physical, chemical, biological, and psychological) and bridge the ideational gap between the Natural Sciences and the Humanities.

With this background in mind, and in accordance with the consistent appeals coming from CSR scholars, it seems wise to (also) understand “religious” as a synthetic category for complex phenomena that cannot be clearly understood in theoretical and methodological isolation, transcending various levels of explanation (biological, psychological, sociocultural, and historical). This sort of careful consideration of the complexity involved in such categories is essential to enable scholars to break down their studied target-phenomena (and records of them) into distinct, although mutually conditioned and informative, “scales of reality” (WATTS; TURNER, 2014, p. 31). In this manner, such perspective eventually shares some resemblance, for example, with historiographical orientations that attach a fundamental role to human biology (brains and nervous systems), cognition and evolutionary histories, just as the ones practiced by large-scale “Deep History”<sup>17</sup> projects.<sup>18</sup> However, and at the same time, such reductive decomposition could also be fruitfully oriented to the analysis of shorter periods of time and particular socio-cultural dynamics. Therefore, this means that, just as it has been the case (for example) of physical geography, both biology and human cognition can (too) serve as auxiliary explanatory levels for reconciling specific historical facts about religious phenomena.

Before moving on, it is worth mentioning a problematic an almost defining feature of complex systems: non-intuitiveness. Their labyrinthine dynamics, functionality, and decentralized organization can escape even the expert’s grasp<sup>19</sup> and their empirical study is often associated with the existence and involvement of a large amount of digitalized or formalized data (WILENSKY; RAND, 2015, p. 10-13). For this reason, research on complex systems is firmly linked to (and dependent of) the methodological extensions of representational technologies, with the impossibility of their direct “naked-eye” analysis acting as a perplexity sign that emphasizes researcher’s epistemic humility. Moreover, it is important to stress that, although they are a way of capturing phenomena in their complexity, such analysis always imply a

<sup>17</sup> A definition of History that rests upon the evolution of anatomically modern humans.

<sup>18</sup> Cf. SMAIL, 2008; SHRYOCK; SMAIL, 2011.

<sup>19</sup> The specific erroneous pattern of human thinking when grasping complex systems has been described as “an expectation for a central, directly determining causality”. Even trained scientists are subject to this bias (WILENSKY; RAND, 2015, p. 13).

“complex, modular or bottom-up, reduction”, i.e., an analytical space created by the researcher, in which he tries to find the simplest possible adequate solution to a specific theoretical problem or explanation to the target-dataset – and not to comprehensively apprehend the systems in their entirety.<sup>20</sup> This skeptical ethos of modeling rhetoric is aptly expressed by an iconic statement of British statistician George Box (1919-2013), who said that “all models are wrong, but some are useful for [exploring and learning about the world]” (BOX, 1976, p.792), before alerting researchers not to model systems to analyze them as such, but above all to study the problems involved with them. In this spirit, the goal here is not to strive for a fundamental reconceptualization of the concept of “religion” as a complex system (PETERSON, et al., 2019, p. 45-61). Rather, our focus is to draw attention to the usefulness of its historical immersion (and that of any other human construct) in a contextual relationship of phenomena known in complexity science as “multi-level history” (and their epistemology); connecting it with some existing research approaches that are already moving in this direction.

## From individual cognition to population-level processes

History, as both a Social and Human Science, covers in itself a broad and fragmented academic space encompassing a considerable number of projects that one could understand as related and exemplary illustrations for the kind of discernment aimed by this article.<sup>21</sup> In this sense, just like in the case of much of Cognitive Historiography<sup>22</sup>, it is vital to understand (for our purposes) the French *Annales* school<sup>23</sup> and its idea of history of *la longue durée* – which defines itself against the more customary historiographical focus on personalities and particular transformative events/ideas – as an exemplary reference.<sup>24</sup> Nevertheless, rather than a *histoire des mentalités*, the “spiritual predecessor” of Cognitive Historiography, the ideas at work here are more directly inspired by the natural-socio-economic History of Fernand Braudel’s

<sup>20</sup> Cf. GREEN, 2019.

<sup>21</sup> Even without direct links, our goals are in many ways similar to those of other projects using formal methods, changing the ideal scope of historical research and its scales, or aimed at a consistent connection between the Natural Sciences and the Humanities.

<sup>22</sup> Cf. SILVA, 2019. The interaction between History, Historiography, and/or Archaeology and cognitive theories.

<sup>23</sup> Cf. BURKE, 2015.

<sup>24</sup> *La longue durée* is better understood as a defense of the idea of longevity as a unifying term for the Social Sciences. Therefore, it would be an exaggeration to treat it as something specifically related to modeling and formalization (BRAUDEL, 1958, p. 752).

(1902-1985) “Mediterranean Sea”, with its interdependent and variously fast-flowing levels of time (BRAUDEL, 1995, p. 21).<sup>25</sup>

In this sense, “multi-level history” is taken to be a concept of heuristic, rather than programmatic, nature – i.e., an orienting scheme that could combine, in the scholar’s research focus, cultural anthropologist Scott Atran’s metaphor of “history as an evolutionary landscape”, wrinkled and conditioned by the deep history of human cognition, together with other elements of long duration, such as natural and cultural environmental conditions (ATRAN, 2005, p. 10-12). This perspective follows some of CSR’s main tenets in an effort to integrate traces and processes from the history of religious beliefs and behaviors into the explanatory levels of the Natural Sciences while, at the same time, trying to listen carefully to philosopher Robert N. McCauley’s call for methodological and explanatory pluralism and opportunism in the study of complex phenomena (MCCAULEY; LAWSON, 2017, p. 1-24). This means, among other things, not to understand the cognitive-evolutionary level of explanation as privileged and exclusive, but to treat it only as one of the possible “deep” or macro-historical factors “canalizing” the cultural and historical landscape of religion – something that researchers may choose to use (or not) in their analyses (ATRAN, 2005, 10-13).

Currently, the idea of Cognitive Historiography mostly appears in consonance with the (increasingly common) critique of isolated psychological experimentation as the preferred method of scientific research into bio-cultural behavior, and the condemnation of presentism as a “theoretical blindness” to the effects of historical variability (SILVA, 2019, p. 196-202) – a criticism often accompanied by calls for the inclusion of textual data obtained from the so-called (past) “dead minds” (EIDINOW; MARTIN, 2014, p. 5-9).<sup>26</sup> However, in the spirit of methodological opportunism and taking into account the considerable amount of historical data formed by material culture, as well as the limitations of current cognitive-scientific theories,<sup>27</sup> a question remains: to what extent such combination of historical evidences, human biology, and cognition is an always necessary and “useful” endeavor? After all, although a cognitive-historiographical orientation towards individual religious beliefs and behaviors prevents the essentialization of religion beyond the manifestations of individual agents, it often does not help in any way in the study of the “realities” of those collective

<sup>25</sup> I.e., the geographical, the socio-economic-cultural, and the time of events.

<sup>26</sup> Cf. SLINGERLAND, 2014.

<sup>27</sup> Recently, the Cognitive Sciences have undergone a lively development, primarily characterized by disputes over the very nature of cognition, which is being reflected in CSR with regard to its unclear causal relationship to culture (Cf. GEERTZ, 2010).

cultural patterns whose traces can be found in historical sources. Moreover, although cognitive social scientist Dan Sperber's project of an "epidemiology of representations"<sup>28</sup> (one of CSR's original cornerstones) contains a call for a transparent and naturalistic ontology (in which culture arises from interactions of individuals), the Cognitive Sciences, by their own, lack concrete examples of convincingly tested methods capable of rigorously conceiving and reconstructing population-level processes of cultural-historical change. In this respect, it may be useful for those historians who cling to the ideal of the study of religion as a life science, to master, for example, modeling and simulation methods capable of doing so, such as those used in Population Biology (MITTAL; DIALLO; TOLK, 2018, p. 321-348; SILVA, 2019, p. 204-206).

Therefore, although the theories discussed here often deal with macro-historical scales, such treatment is not primarily concerned with placing the historical study of religion in the framework of the macro-historiography of civilizational units, such as in Immanuel Wallerstein's (1930-2019) world-systems<sup>29</sup> (WALLERSTEIN, 1987, p. 203-207), or with research at the level of the largest population patterns, which are of interest, for example, for Peter Turchin's Cliodynamics (TURCHIN, 2008, p. 34-35).<sup>30</sup> Additionally, rather than promoting the concept of "history" as a complex system, what we are dealing here is solely an effort to introduce a methodological approach that studies the local subjects of historiographical interest in the environment of complexity theory. Finally, in relation to the History of Religion, which typically deals with specific collective patterns and ruptures in religious beliefs and behaviors, rather than with general theories, the emphasis here is in the prospects of modeling and formalization as tools for both engaging with the resolution of specific historical and "local" problems and to overcome some general limitations of more conventional historiographical methods.<sup>31</sup>

<sup>28</sup> The explanation of cultural phenomena through the examination of how mental representations are distributed within a target-population (SILVA, 2019, p. 195).

<sup>29</sup> A socioeconomic system that encompasses part or the entire globe, detailing the aggregate structural result of the sum of the interactions between polities.

<sup>30</sup> A transdisciplinary area of research integrating (neo-Darwinian) cultural evolution, Economic History, Macrosociology, the mathematical modeling of long duration historical processes, and the analysis of historical/archaeological databases (Cf. TURCHIN, 2008).

<sup>31</sup> Cf. SILVA, 2019.

## The “complexity landscape” and the boundaries of “conventional” Historiography

Despite its undeniable achievements, Historiography at large, and not only the historical study of religion, sooner or later encounters several fundamental problems that clearly illustrate the feasibilities and cognitive constraints of the so-called “conventional way”<sup>32</sup> of doing History – primarily oriented to events and human actors/ideas as the main sources of historical change. Through this perspective, history is seen primarily as an amalgamation of sequential events evoked by conscious human actions (or reactions), decisions, and intentions. The task of Historiography would be then to reconstruct and organize these events into a coherent historical narrative, in which turning points in past episodes are often understood as the direct or indirect result of the activities of key-actors. This teleological element, often concealed rather than clearly declared, tends to lead to an implicit selection of incidents to which a historical value is assigned at the expense of many others who are neglected or, otherwise, marginalized (MANDELBAUM, 1967, p. 414-415). Such conception of history is largely based on an intuitive understanding of chronologically ordered events in an anthropocentrically limited spectrum of time and on the biased constraints of ordinary human cognition, incapable to observe and predict the consequences of phenomena following a nonlinear course. Hence, through this point of view, much of the outcomes of the occurrence of complex macro-historical factors and their participation in shaping the course of historical processes remains somewhat hidden.

Data on which the historiographical reconstruction of past events and processes is based are always incomplete in nature, and their preservation or discovery is largely decided by random or secondary factors (e.g., certain institutional interests) that do not necessarily reflect their “original” relevance and representativeness. Thus, the historian always works with fragmentary information, which forces him to skip blank spaces and connect individual sources into a narrative that, under given conditions, he considers the most credible and the closest possible to an already known (or conventionalized) course of events (SILVA, SANTOS, 2017, p. 40). Although many historical sources have been irretrievably lost, in some cases the historian is confronted with the fact that a large amount of surviving data, relating to one and the same event, can either be combined into a number of similarly plausible narratives or these sources contradict each other to such an extent that their simple evaluation and combination (or connection) cannot

<sup>32</sup> Here, we treat this designation as an ideal type, without declaring any implicit developmental dichotomy between concepts such as “traditional vs. progressive”. Therefore, it is a necessary academic partner in the process of deepening our historical knowledge.

create a meaningful historical account that would meet the most basic demands of logical coherence. Thus, in such situations, a question remains: which of the possible narratives should be preferred, and based on what criteria?

Much of historiographical research is largely dependent on texts, which (again) deepen the tendency of historians to conceive history as a sequence of events that could be captured through a narrative based on the interpretation and evaluation of consciously created literary sources. As mentioned above, one of the negative consequences of this more conventional orientation towards text corpora is the tendency to neglect the complexities of macro-historical processes, which are capable of influencing the course of history in ways often not recognizable other than from a retrospective perspective based on a large set of data covering long periods of time.<sup>33</sup> Even more, any History structurally focused on the (anthropologically) recent trajectory of great civilizations, which dates back to the origins of writing, ends up neglecting those long millennia of human development that are not captured, nor can be captured, by the methods of meticulously text-oriented historiography.<sup>34</sup> For this reason (too), “conventional” historians usually have no experience with methods that seek to recognize the complexity involved in the unconscious and unintentional dimensions of human history – most of which depending on quantitatively oriented digital technologies.

Moreover, texts themselves can be understood as complex communicative artifacts, which, transcending their intentional messages, also mediate evidences of technological and cultural complexity, something that is only revealed by a combination of “readings at different scales”. In the spirit of the ideal model created by Italian literary historian Franco Moretti, it can be said that the predominant way of reading historical source texts is “close reading” – in which the researcher pays careful attention to the details of individual statements, to hermeneutically process the text that structures them and reveal its message in an adequate historical context. In this mode of detailed reading, however, the structure of the “text landscape”, associated with the unintended layers created by the stagnation and transformation of the textual artifact in its own ecology of time and space (long-term histories and textual trends), is necessarily “optically blurred”. Thus, such textual landscape will only emerge when the reader’s focus is widened, and its target (then) “compared to its pairs” in a larger-scale through “distant reading”

<sup>33</sup> Cf. SILVA, 2019.

<sup>34</sup> Cf. SMAIL, 2008. Proponents of so-called “deep histories” explicitly criticize this conception, which programmatically identifies the beginning of human history *sensu stricto* (as opposed to prehistory) with the emergence of the first civilizations (SILVA, 2019, p. 201).

(SILVA, 2019, p. 193).<sup>35</sup> The goal of this kind of analysis is the use of computational and statistical tools to create formal models of extensive text corpora, allowing for both its internal and external quantitative comparison.<sup>36</sup> This understanding of texts as quantitatively descriptive structures refers to an important dimension (or level) of the “modeling and formalization” logic. Put it simply, it enables and represents a strong and little-emphasized innovation in the available literature, which from the point of view of most historians may seem to be a form of “sacrilege”: the act of artificially and actively constructing/modeling the very own (emergent) large-scale historical processes that ought to be explained.<sup>37</sup>

### Building historical records: data or *capta*?

In the analytical construction of any phenomena, the researcher’s responsibility often begins when working with documents that testify to his target-object of inquiry. Current claims for the use of historical expertise in research into the natural and cultural evolutionary landscape of religion often include a general grasp of this kind of knowledge as usable *data* (raw information, i.e., what it is, what is given). In this context, projects of large historical databases that seek to collect “big data”<sup>38</sup> on past populations or its quantitative history can be viewed with critical skepticism from the point of view of “conventional” Historiography,<sup>39</sup> as they contain a difficult-to-validate and easily questionable transformation (operationalization)<sup>40</sup> of distributed qualitative expertise into structured digital data usable for quantitative analysis. Such transformation of qualitative into quantitative information brings with it, above all, the search for a common currency and scale in which these data become comparable. Yet, in History, this process presents a primary challenge with regard, for example, to time coding. After all, one of the most remarkable currencies of historical sources is their dynamism (i.e., records of the transformation of the target-phenomenon under short- to long-term

<sup>35</sup> Cf. MORETTI, 2013.

<sup>36</sup> These methods have been successfully used, for example, in historical “compared stylometry”, where they provided excellent results in determining implicit textual trends (Cf. SLINGERLAND, et al., 2017).

<sup>37</sup> Automated methods for extracting information from texts (“text mining”), and subsequently modeling it, are apparently a promising tool for any long duration Historiography (Cf. NIELBO; NICHOLS; SLINGERLAND, 2016).

<sup>38</sup> The concept of “big data” indicates a massive amount of diverse and often rather unstructured data related to a single phenomenon. For “big data” in the Humanities, see MANNING, 2013; KAPLAN, 2015.

<sup>39</sup> For a sharp critique of exacerbated “scientific” approaches to History in the context of the recent redefinition of CSR, see MARTIN; WIEBE, 2017, p. 107-122.

<sup>40</sup> Also known as “data modeling”, it includes at its core an activity that is more commonly called “operationalization and coding” in quantitatively- (but also qualitatively-) oriented methodologies.



perspectives). Therefore, during the data modeling, this variability – typically taken by modelers as unambiguously quantitative – usually ends up being unconsciously recorded and thought out rather qualitatively (i.e., even critically processed time data contains different degrees of uncertainty and estimation). Unintended problems like these represent legitimate epistemic reasons for the “conventional” historian’s special distrust in building large historical databases though the collection and quantitative transformation of qualitative data from many different sources.

Let us not forget, taken alone, historical documents are typically characterized by sparse and statistically unrepresentative sets of information, which only due to critical historiographical work can often become statements about the past, or *data sensu stricto*. Likewise, when in connection with historical materials, it is (solely) appropriate to talk about the “nature” of complex modeling in light of a particular set of theories and assumptions. This attitude is well illustrated in present discussions coming from the field of Digital Humanities, for example by theorist and cultural critic Johanna Drucker, when she claims that “all *data* is *capta*” – i.e., more akin to something “deliberately collected” rather than just “given” (DRUCKER, 2011, p. 20). In her critical evaluation of the usage of a typical formal model (in the form of visual graphs), Drucker draws attention to its possible relation to different ideal types of epistemological positioning. From this perspective, while the Natural Sciences work within an observer-independent realism, for Humanities researchers the imperative is a sort of natural constructivism of the interdependence between the observer and the object (DRUCKER, p. 50-51).

Therefore, in that which concerns the study of human constructs and knowledge, the use of formal methods (i.e., quantitative analysis) cannot be understood as grasping the “reality of the sources”, always being linked to processes of additional transformation: *data* will always be *capta*. Moreover, these transformations will often provoke mistrust among scholars, given that they potentially increase the distance between the target-phenomenon and its observer, thus intuitively (further) distancing any perceiver from the “reality”.<sup>41</sup> Consequently, in complexity science, although historical data will usually end up forming an increasingly complex construct created by a series of interpretive acts, rather than the result of direct measurement, this does not mean that they cannot be used to analyze formally conceived problems, while maintaining (simultaneously) the transparency of their transformative process. In other words, although as transformed

<sup>41</sup> While detrimental to the implicit realistic stance associated with the “correspondence theory of truth”, this way of handling documents is coherent with the “consensual concept of truth”, where the arbiter is the critical discussion of a professional community.

traces modeled data cannot show phenomena in their originality, if taken carefully they might clearly and innovatively answer specific research questions about them.

## Systematically and critically processed Historiography

As an act of both translation and interpretation, the process of “modeling and formalization” thus hides in itself two connected and polarized epistemological movements: the first one potentially refines and contributes to critical processing (i.e., it allows, for example, transparent abstractions, the creation of new knowledge and the evaluation of existing ones); the second, when not consciously explicit, potentially blurs the scenario again, recreating the same or even more problems than the ones it intends to solve. Put it simply, we usually see the benefit of such techniques (especially) in those areas of research in which there is already a considerable level of systematically and critically processed knowledge. But in order to meaningfully and defensibly unravel the nature of “raw” documents through any formally precise conjecture, as well as to combine disciplinary perspectives, it is essential not to lose touch with traditional expertise, which tends to be especially necessary in situations where the validity of the data and results thus obtained depends on critical discussion. Historiographical knowledge, for example, tends to be characterized by the possibility of simultaneous interpretations of one set of documents, the accuracy of which is difficult to decide because their transparent comparison is significantly problematic. Accordingly, it is precisely because of such characteristics that History could be a perfect test-bench for the power and potentials of a structurally early and carefully overseen adoption of formalizing approaches, allowing new ways of formal, and therefore more transparent, comparisons.

In Academia, we are already seeing these new possibilities of comparison in creative and rigorous thinking within formal environments, both at the data level and at the level of theories. From these examples, one can assume that such methodological approach (associated with the epistemological position of complex systems theory) offers to the History of Religion (but not only to it) both, analytical tools for grasping unique historical contexts (e.g. in the form of the origins and dissemination of a particular religious tradition) and instruments for creating and thinking about those general analytical constructs through which these contexts are explained and interpreted (e.g. at the level of the “epidemiology of representations”). At the same time, “modeling and formalization” might act as ideal synthesizing tools through which empiricism and theorization meet closely and can inform each other. Historiography often works implicitly with abduction logic – i.e., it tries to derive the best possible explanation for a given phenomenon from

a rigorous connection of available documents and theories (MCCULLAGH, 1984, p. 12); however, the nature of historical data (i.e., their rarity and incompleteness) leads to the fact that there may be several such best explanations side by side (GLOMB *et al.*, 2018, p. 117-120). Developing on what we have previously mentioned, it is here that we see the greatest power of so-called “generative computational modeling”,<sup>42</sup> which aims to operate at the macro-level of explanation, using a formal model of the target-process that is capable of establishing it by means of the interactions of its organizational details.<sup>43</sup> Clearly, many historical phenomena can be understood as macrostructures, emergent consequences of a series of complex interactions commonly conditioned by various factors. Without a “close reading” of the evidences and theoretical insights from the relevant Social and Natural Sciences (e.g. Anthropology or Climatology), it is obviously difficult to identify these factors in the network of details surrounding them. However, without “distant reading”, it is then hard to imagine the scope of their effects over a long duration. Only through a transdisciplinary method that allows these perspectives to be quantitatively combined it becomes possible, for example, to transparently decide on the relative strength of the evolved factors and to search for, and distinguish, key or (conversely) less relevant causal connections or patterns on their dynamics.<sup>44</sup>

With that in mind, it is vital to exacerbate that, howsoever, both modeling and formalization can be chosen to serve largely distinct purposes at different stages of research: they allow 1) to rigorously think and compare large amounts of historical data (e.g. creation of virtualized data and databases); 2) to transparently supplement these data with qualified estimates and assumptions, and thus test these assumptions (e.g. through “generative computational modeling”); 3) to operationalize them into selected invariant structures or explanatory levels (e.g. into the mechanisms of human psychology, but also into physical communication networks); 4) to use methods for the study of complex systems (e.g. analysis of complex social networks); 5) to clearly formulate theoretical assumptions and imagine the consequences of combining several theories (given that quantitative data are stabilizable under common currencies and scales); 6) to model individuals and collective patterns together by managing the processes that connect them (e.g. to decide which scenarios for the emergence of these target collective patterns are more likely than others). In any case, it is worth

<sup>42</sup> “Artificial society modeling allows us to ‘grow’ social structures *in silico* demonstrating that certain sets of micro-specifications are *sufficient to generate* the macro-phenomena of interest” (EPSTEIN; AXTELL, 1996, p. 20).

<sup>43</sup> Cf. EPSTEIN, 2007.

<sup>44</sup> Conceived in this way, Historiography could be understood as akin to “applied science” in the technical sense, at least according to the nestor of Cliodynamics, Russian-American biologist Peter Turchin (Cf. TURCHIN, 2011).

to reinforce that, regardless of the epistemological power and new possibilities of such techniques for both research and its presentation, traditional descriptive narrative will always remain an essential and necessary tool for History, as well as many other Human and Social Sciences.<sup>45</sup>

## Prospects and current limitations

Until now, under the heading of “modeling and formalization”, we have combined several methods that, from a historian’s point of view, may seem very similar. Nonetheless, from the perspective of mathematicians or computer scientists, for example, these are, definitely, different worlds, each of which including its own diverse complexities. Throughout this article, we have, briefly and perhaps too synthetically, introduced domains that would otherwise deserve their own separate treatment. Such heuristic movement allowed us to argue monolithically for modeling and formalization practices as facilitators of new ways of analyzing large numbers of initially inconsistent documents, and to claim that, due to their need for precise specification, through these techniques, transdisciplinary interpretive decisions may escape the vagueness of (human) natural language and acquire new levels of transparency. However, it must be emphasized that (here) we are dealing with possibilities, not with automatic error-free necessities.

One of the critical thorns that formalizing approaches aggregating large amounts of digitalized historical data must cope with in the future is, precisely, the transparency of their initial formalization process. The erudition of every conventional historiographical work is based, among other things, on the clear anchoring of the scholar’s analysis in structuralizing sources. When modeling and formalizing, this poses a two-pronged challenge, especially for large database projects: 1) first of all, due to their huge number, the problem is how to grasp the extensive overview of resources and expertise on which databases derive from; 2) secondly, in their composition these projects involve a number of partial interpretational steps that are externally difficult to validate, distributed among numerous teams of experts. Naturally, when based on problematic datasets, even small and locally limited studies cannot avoid possible difficulties, with their validity occupying a space rather analogous to scientific experiments, requiring replication and meta-studies – but this is not the point. The most important thing (here) is to clarify that even formal methods of analysis (or any statistically evaluated hypothesis-oriented research whatsoever) have their “epistemological

<sup>45</sup> Cf. EPSTEIN, 2008.

blind spots”, usually emerging from their dependence on data with a good signal-to-noise ratio (i.e., the ratio of useful compared to meaningless information). Due to its intricate nature, the analysis of complex data often produces false-positive results by simple chance; moreover, regardless of the sophistication of quantitative analytical methods, they can develop a tendency to hide the biases arising at the level of selection and transformation (quantification) of documents in light of implicitly pre-accepted historiographical hypotheses (MARTIN; WIEBE, 2017, p. 107-122). Therefore, the success of “modeling and formalization” in History (and in the Humanities at large) is mostly dependent on a certain critical-historical clarity and in a strong presence of conventional hermeneutical expertise (domain) and awareness, from the very inception of the formalizing procedure.<sup>46</sup>

That being said, outside of specific applications, when dealing with formal modeling as a field in itself, it is important to distinguish the existence of several independent traditions.<sup>47</sup> In this study, for example, we monolithically referred to two forms of modeling complex systems that could be contrasted more nuancedly. The first and less referenced one is the so-called “mathematical modeling”, i.e., the modeling of system dynamics using differential equations. A top-down research perspective is typical for this approach, where the model works at the level of the mathematical correlations that express the dynamics of the whole, thus consciously neglecting its component details and local/internal interactions. This tradition of modeling, which is not necessarily computer dependent, is often used in Economics, and its current historical usefulness has been predominantly represented by Peter Turchin’s Cliodynamics project.<sup>48</sup> In contrast, what is known as “computational modeling” correlates best with the application of ABM in the Social Sciences, which constitutes a completely distinct type of modeling tradition. ABM always requires a software-based virtual environment and is characterized by an emphasis on modeled bottom-up interactions of individual units, creating complex collective patterns (e.g. population processes) that only emerge as a result of the behavioral micro-specifications of especially programmed agents (e.g. persons). This method is still waiting for a more significant adoption in historiography<sup>49</sup>, but it has

<sup>46</sup> Italian historian Leonardo Ambasciano expands this viewpoint in his constructive critique of the cognitive-scientific apprehension of so-called “Big Gods” as a historically fundamental source for the internal cohesion of large societies (Cf. AMBASCIANO, 2016).

<sup>47</sup> Cf. FRIGG; HARTMANN, 2020.

<sup>48</sup> However, the specific macroscopic scope of the modeling involved in such perspective has its social scientific limits, as its driving forces are aggregated into homogeneous blocks and the models used do not contain micro-macro connections (Cf. EPSTEIN, 2007).

<sup>49</sup> Cf. GAVIN, 2014; SILVA, 2019.

already become a well-established research tactic within Anthropology and Religious Studies.<sup>50</sup>

Another similar, but largely separate area of formal modeling is the so-called “complex networks analysis”, an interdisciplinary field related to the “social networks analysis” movement (SNA), established during the second half of the 20th century as a result of the combination between the subfield of Relational Sociology and the mathematical analysis of graphs.<sup>51</sup> SNA is characterized by the modeling of social structures as mathematically graspable networks of nodes and edges (in the form of persons and their various inter-individual ties), in which, for example, the importance of individual nodes can be calculated based on the structure formed by their edges. However, going far beyond the SNA movement, the related but basically independent conceptualization of a “complex networks analysis”<sup>52</sup>, and the further development of its own methodology, resulted in a wide range of different applications across the Natural, Social and Human Sciences, where, especially in historical-archaeological research, complex networks are used for illustrating the structural delineations of agent-based complex systems.<sup>53</sup>

With this comprehensiveness in mind, although we consider the complexity theory to be a significant element enabling new ways of research in the historical study of religion, it is important to remember the epistemic framework that encompasses it is not necessarily equated with new representational technologies. After all, both modeling and formalization can assume more conservative positions, limiting themselves to the mere use of computational methods to help examine historical evidences or to support specific historiographical arguments – a conceptualization often developed in the area of Digital Humanities and, more directly, inside the newly developed field of Digital History.<sup>54</sup> Ergo, within “modeling and formalization”, computer-assisted methods<sup>55</sup> are better understood as materially anchored activities that indirectly control and negotiate

<sup>50</sup> Cf. LANE, 2014.

<sup>51</sup> The origin of SNA dates back to the 1930s, to the author of the “sociogram” concept, Romanian psychiatrist and psychologist Jacob Moreno (1889-1974) – since the 1950s, its systematic use has been associated with sociologist Harrison White (Cf. FREEMAN, 2004).

<sup>52</sup> Many complex networks are characterized by a non-trivial topology, which is equally exhibited by network models of real systems, both in nature and in human societies. This phenomenon is the so-called “scale-free” property (Cf. BARABÁSI, 2016).

<sup>53</sup> Cf. COLLAR, 2013; BRUGHMANS; COLLAR; COWARD, 2016.

<sup>54</sup> Cf. GRAHAM; MILLIGAN; WEINGART, 2016; MULLENEM; ROBERTSON, 2017.

<sup>55</sup> Due to its potential fruitfulness, spatial analysis using Geographic Information Systems/Science methods deserves a separate mention (CF. LÜNEN; TRAVIS, 2013).

the extension of thinking processes, rather than as specific necessary methodologies that can be easily and casually applied to broaden research horizons.

Accordingly, whether regarding the conservative usage of digital tools or their use for bold transdisciplinary extrapolation in complexity models, modeling and formalization processes are ways of “thinking within a method” or “thinking with a method”,<sup>56</sup> for which its dual-corporeality is vitally important (i.e., in this case, the formality and the digitality created by the computerized environment of analysis) in setting new standards for historical data visualization and comparison. That being the case, there seems to exist a meaningful analogy between such techniques and traditional sociological-hermeneutical understandings as embodied practices – something equally observed, for example, by Czech sociologist Zdeněk Konopásek in connection with the context of qualitative analyses carried out through the Atlas.ti software. In both cases, “software packages would be better understood not only as ‘mere tools’ [...], but also as complex virtual environments for embodied and practice-based knowledge making” (KONOPÁSEK, 2007, p. 276).

## Challenges, implications and concluding thoughts

One of the biggest but rarely discussed challenges of modeling and formalization as tools for exploring transdisciplinary spaces is the effectiveness of the actual interdisciplinary collaboration between experts from different disciplines in solving a common research topic or program. The traditional way of working in History is individually, although historians always stand on the shoulders of the giants of previous-generations. Yet, regarding the creation of formal dynamic models of historical processes, it is almost necessary to establish and maintain interdisciplinary teams capable of long-term intensive communication between their individual members. Notwithstanding, in Academia the natural boundaries constraining disciplines are, in a Wittgensteinian sense, their specific “language games” whose vivid translation into a common imaginative currency, competence, and, ultimately, extramural research strategy is time-consuming and often institutionally painful. The emergence of a “distributed intelligence” transcending such boundaries thus requires not only considerable openness and patience of all involved and enthusiasm for consensus, but (above all) time.

<sup>56</sup> Italian philosopher Lorenzo Magnani aptly describes the concept of “modeling” when he writes that it is a form of manipulative abduction, a “thinking through doing and not only, in a pragmatic sense, about doing” (MAGNANI; NERSESSIAN, 2002, p. 309).

For proper transdisciplinarity, mutual team respect and shared competencies contributing to the creation of new solutions for research questions emerging at the inter-individual physical level are not enough. Truly comprehensive *sensu lato* scientific knowledge arises only through circulation in networks of academic communities and through institutionalized respect for hybrid transdisciplinary projects. Besides, while new collective research methods are able to provide novel collaborative explanations, they require the development of specific competencies, both at the level of their validation as of professional reception.<sup>57</sup> Any cooperation between historians, anthropologists, cognitive scientists, and computer scientists (for example) creates a type of academic product for which it is a huge challenge to find the right way to present it to all of its possible audiences, which are responsible for its critical evaluation. As past transdisciplinary experiences have shown, it is very difficult to create a situational bridge between different specializations in the usually short time dedicated to a standard research project in a way that would allow the modeled problem to be “grasped more entirely” (LANG, 2016, p. 114). Naturally, individual professional audiences pay attention primarily to that which is limited to the dimensions of their own traditional expertise, and without adequate exposing statements, it can be very difficult to thematize, appreciate, and (above all) critically comment on those results strongly embedded in transdisciplinary frameworks. Complex phenomena may require complex methods to be able to produce impressively complex repercussions; however, in spite of their innovative character, without comprehensible and convincing framing narratives, they will never become (by themselves) part of any professional academic discussion.

Throughout this study, we tried to build a narrative of this sort. On the one hand, this article noticed the existent limited contribution coming from CSR to the Historiography of religious beliefs and behaviors. Yet, on the other, it discussed some of the usual limitations of “conventional” Historiography arising from its habitual anti-metanarrative orientation towards the histories of persons and particular events/ideas rather than to *la longue durée*. With that in mind, we tried to present “modeling and formalization” as a new variety of offers for those experts dealing, at least marginally, with the History of Religion who are sympathetic to current tentative courtships between the Natural Sciences and the Humanities, but (so far) have not yet found suitable inspiration in the available alternatives – for example, those coming from Cognitive Historiography.<sup>58</sup> We believe that such processes, once understood as a broader methodological orientation or as a set of innovative methods for working with historical sources, can lead to

<sup>57</sup> Cf. GREEN, 2019.

<sup>58</sup> Cf. SILVA, 2019.



adventurous but still rigorous transdisciplinary projects and, thus, offer not only novel solutions to old problems, but also (and above all) the formulation of completely new questions. In this respect, it is good to imagine such enterprise not just as an attempt of conciliating the Natural and Human Sciences as complementary fields for rational epistemological thought-practices, but principally as a creative engineering project expanding the researcher's cognition through technological rather than theoretical extensions.

When philosopher and historian Sara Green noted that the metaphor of reverse engineering is used in Systems Biology as a rational and methodological heuristic for detecting or (possibly) imitating biological systems, she immediately critically contrasted it with an inquiry into non-hypothesis exploratory research, which she likened to a kind of "reverse do-it-yourself".<sup>59</sup> Similarly, research innovation in the Humanities is often a reflection of creative wandering rather than a rational plan. In some ways, this meandering is actually even a natural part of any disciplinary research process, and "modeling and formalization" offers (here) not only the possibility of arriving at a potentially more accurate knowledge, thanks to the unique properties of formal media, but also the means for the emergence of increasingly precise doubts. In other words, through it we might determine, with greater academic coverage, clarity and certainty, that what we actually (no longer or not yet) know.<sup>60</sup>

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<sup>59</sup> Cf. GREEN, 2019.

<sup>60</sup> Cf. EPSTEIN, 2008.

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## ADDITIONAL INFORMATION

### ACADEMIC BIOGRAPHY

Thales Silva holds a Bachelor's degree in History with specializations in Classical Studies, Anthropology and Archaeology from Universidade Federal de Minas Gerais (UFMG). He is a member of the 'Cognition, Evolution, and the Biological Basis of Religion' research group at Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), holding a Master's degree in Cognitive Anthropology of Religion and being a doctoral candidate in Cognitive and Evolutionary Sciences of Religion at Universidade Federal de Juiz de Fora (UFJF). His main areas of interest and expertise include major topics within Cognitive Historiography and Anthropology, especially the following: Cognitive Science of Religion, Cultural Evolution, Neuroanthropology, Evolutionary Psychology, Philosophy of Cognitive Science, and History of the Behavioral and Brain Sciences.

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## CONFLICT OF INTEREST

No declared conflict of interest.

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## ASSOCIATE EDITORS

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