# A HYDRA-LOGICAL APPROACH: ACKNOWLEDGING COMPLEXITY IN THE STUDY OF RELIGION, SCIENCE, AND TECHNOLOGY

*by Robert M. Geraci*

*Abstract.* Scholarship has grown increasingly nuanced in its grappling with the intersections of religion, science, and technology but requires a new paradigm. Contemporary approaches to specific technologies reveal a wide variety of perspectives but remain too often committed to typological classification. To be vigilant of our obligation to understand and reveal, scholars in the study of religion, science, and technology can adopt a hydra-logical stance: we can recognize that there are cultural monsters possessing scientific, technological, and religious heads. These heads may work with a common agenda or they might not. They might disagree, pulling their shared body back and forth in a public commotion that lays waste to their surroundings. They might see past one another or move in tandem—purposively or not. Evaluations of climate response and AI benefit from seeing how the various heads are inseparable: indeed, cutting one off simply promotes the growth of new heads. Methodological and analytical clarity, therefore, emerges in the transition from schemes of classification to the recognition of hydras.

*Keywords:* artificial intelligence; classification; climate science; Ian Barbour; method; religion and science; typology

## Introduction: A Monstrous Perspective on Religion, Science, and Technology

The overwhelming presence of technology in daily life has made the intersections of religion, science, and technology ever more pronounced and ever more prevalent in public life. Smartphones, the Internet, CRISPR-Cas9, manufactured bacteria, military drones, artificial assistants at home and in the office: such technologies provoke reactions from religious groups and are sometimes even the outcomes of religious considerations. Epistemological crises and existential threats to humanity likewise intersect

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with religious hopes and fears. From genetic chimeras to armed drones, these moments of intersection appear as both literal and metaphorical monsters. Such complications of modernity have exposed both old and new ways for religion, science, and technology to interact, and have led to consequent increase in public and scholarly engagement (see Tirosh-Samuelson 2010).

Public perception and even journalism often lag behind progress in academic studies and in these domains complexity is often shrugged aside in favor of a longstanding narrative of conflict. "Since the time of Galileo, science and religion have been at war" is the refrain of countless student essays (despite their professors' tireless efforts![1]) and it also runs rampant through public life. That no one considered heliocentric debates as an example of warfare between religion and science in the time of Galileo and that political considerations dictated the outcome of those debates hardly seems to matter.[2] Without doubt, one of the primary obligations of scholars in the study of religion, science, and technology is to counter the preconceived notion that religion and science exist as entities waging war with one another.

To address the conflict thesis, scholarship has grown increasingly sophisticated in its methods for grappling with the intersections of religion, science, and technology. Careful and critical approaches to specific technologies reveal a wide variety of perspectives: theological, anthropological, sociological, historical, and philosophical. Scholars go to great lengths to limit the nettlesome persistence of conflict narratives, but in doing so typically employ schemes of classification that confound nuance and limit accuracy. Because scholars take pains to provide *alternatives* to conflict, they multiply the number of potential relationships between religion and science and then assign particular instances to one of those alternatives. Scholars employ more options and build typological classifications that, alas, still cannot accommodate reality.

Scholars remain understandably committed to the schemes of classification that shackle them almost as fiercely as does the conflict narrative in the popular press. After all, those schemes upend the conflict thesis and provide additional perspectives. When scholars lack such schemes, they often yearn for the clarity that classification produced and find themselves without any way to tie the phenomena together. But the classifications we use also fail to create a cohesive description. How, for example, are we to account for all the different valences of the BlessU2 robot? To name just a few: it performs a Christian blessing, calls into question the role of religious authorities, elicits both positive and negative reactions from users, raises questions about technological progress and traditional religion, and offers a new model for the mediation of divine activity. It would be difficult to analyze BlessU2 through a typological classification and this frustration then inclines scholars to consciously or subconsciously limit the scope of

**Figure 1.** Three-Headed Hydra in Cave Art. [Color figure can be viewed at wileyonlinelibrary.com]

their analyses. Accepting hybridity, interconnection, and mutual incommensurability among religious, scientific, and technological phenomena can be challenging even when these are held to be relevant—at a minimum, scholars in the middle of multidisciplinary approaches often find there is no clear and obvious home for their work. At worst, scholars concede the match and resort to lopping off relevant facts or relations to make analysis simpler.

To avoid the hazards implied by classification, scholars in the study of religion, science, and technology can adopt a hydra-logical stance. Specifically, the hydra-logical approach will help scholars see and describe complexity rather than succumb to the temptation of assigning singular interpretations. It provides a dynamic model to show the ongoing cultural processes of religion, science, and technology. We can recognize that there are cultural hydras (Figure 1), monsters possessing scientific, technological, and religious heads. These heads may work with a common agenda or they might not. They might disagree, pulling their shared body back and forth in a public commotion that lays waste to their surroundings. They might see past one another or move in tandem—purposively or not. To help clarify this method, I will offer two widely disparate examples of religion-science-technology hydras: climate response and popular approaches to robotics/artificial intelligence (AI). Evaluations of climate response and AI

benefit from seeing how the various heads are inseparable: indeed, cutting one off simply promotes the growth of new heads. Methodological and analytical clarity, therefore, emerges in the transition from schemes of classification to the recognition of multiheaded hydras.

## Complications of "Religion," "Science," and "Technology"

Even proposing that religion-science-technology hydras exist requires that we make some classificatory statements. After all, some things must therefore be classifiable as "religion," "science," or "technology." The difficulties in defining religion, in particular, have become legend, and thus we cannot simply move along without acknowledging them. But to considerable extent the legendary difficulty of defining religion lives up to the dual meaning of the term. It is profound in its complexity but also more speculation than foundation in the lived experience of human beings. We cannot ignore the difficulties of terminology, but they will not have the last word. In this section, I point toward fluid definitions of these terms without necessarily weighing into the debate over which is best or providing a theory on how those definitions fluctuate and respond to one another.

Most assuredly, religion is tough to define. Indeed, it is so hard to unequivocally define that entire papers have been written to describe the problem, including efforts to defend such ambiguity as intellectually valuable (e.g., Comstock 1984). One effort to list definitions of religion includes forty efforts without even attempting to be comprehensive (Toth n.d.). Furthermore, the increasing recognition of the colonial and imperial history of the term has made it problematic for many scholars. The deployment of comparative religion as a discipline was specifically founded as a colonial enterprise and was used for political control. David Chidester shows how the assignment of the word "religion" to indigenous beliefs and practices was temporary and political, granted in times of peace, and removed as a way of delegitimizing native peoples' cultures and justifying European expansion (Chidester 1996, 2014). Naturally, the coconstruction of religion as a concept and colonialism as a politico-economic model makes it necessary to recognize the demerits of the term and emphasize its intellectual weaknesses. The Christian origins of the word make for particular difficulties, as it may not apply well to many global cultures where its application frequently obfuscates ongoing political agendas (Asad 1993, 29; Balagangadhara 1994; McCutcheon 2001, 10). Despite these difficulties, there is a long history of scholars arguing forcefully toward concrete definitions that provide meaningful room for analysis (e.g., Ferré 1970; Schaffalitksy de Muckadell 2014).[3]

There can be no doubt that the definition of science is also historically contingent, though at present it is subject to fewer debates than the term

religion. Perhaps this is because, as Peter Harrison (2015, 187) notes, the meaning of science, "to some extent…depends upon standing in a particular relation to 'religion'—as representing a kind of rational counterpart to an irrational belief system, an alternative source of meaning and value, or a more advanced stage of human development that was destined to replace a more primitive age of religion." Taking advantage of fights over how to define religion allows science to eliminate some, though not all, of the muddle.

The term "science" replaced "natural philosophy" and has been in use since at least the seventeenth century (McColley 1937), though the term *scientia* dates considerably further back. The definition of science has seen progressive refinement since its origin in the early modern era. Following the Vienna Circle's insistence upon verifiability as the deciding quality of science, the twentieth century has seen science defined as the method of verified hypotheses (Benjamin 1949), testing and confirming (Carnap 1936; 1937), an opposing condition of logical falsifiability (Popper [1959] 2009; Lakatos 1970), a historical process of problem solving and paradigm shift (Kuhn [1962] 1996), and even knowledge accumulation in total absence of defining method (Feyerabend [1975] 2001). All of these debates have been philosophical and sought to rise above the *realpolitik* by which Europeans accelerated their scientific work through colonial domination and simultaneously defined it through that same political process (see Baber 1996). That science has also taken on an evaluative status as the "best" way of doing things further complicates our consideration, as does the fact that a "scientific spirit" can seemingly be applied to a host of domains (Benjamin 1949, 192). Nuanced debates continue among philosophers and historians, but the general sense of science as methodical, naturalistic investigation of the empirical world possesses a reasonably widespread consensus that definitions of religion lack. As noted, the production of science as an endeavor happened to some extent as rejection of religion, so it will come as no surprise that much of the contention over the definition of science comes in relation to religion. The squabble over Creationism and evolution in the United States produces vigorous debate—legal as well as philosophical—over what constitutes science and what does not (Herlihy 1982; Shermer 1991).

Defining science in the context of Creationism (i.e., religion) is a recent configuration of a pattern echoing through the history of science and religion. Historical analysis of the twentieth century clearly shows that definitions of religion and science change, and they do so in response to one another (Gilbert 1997, 9). In his Gifford Lectures, published as *The Territories of Religion*, Peter Harrison shows how the popular view of religion and science in conflict owes itself considerably to how the terms have taken on their modern meanings in response to one another. He argues that the modern conflict thesis was made possible by the way *scientia* and *religio*

both transformed from inner virtues into "concrete and abstract entities that are understood primarily in terms of doctrines and practices" (2015, x). His argument necessarily omits many of the political moves and social contexts in which religion-science conflict was conceptually built. But Harrison nicely traces how the ancestors of our terms religion and science changed dramatically, particularly in the early modern era; he also argues that the terms continue to suffer some incoherence in meaning, perhaps especially because of how they are defined against one another (Harrison 2015, 187).

There is less argument over the meaning of "technology," but it too bears the imprint of dispute. Not least among these difficulties is determining the relationship between science and technology, a struggle that occupies both philosophers and historians (see Alexander 2012). What counts as technology is a fundamentally political question, one implicated in the same colonial politics that governed the rise of "religion." Although the colonizing ethos of Europe began with a sense of cultural and religious superiority, it shifted to a belief that Europe's emergent technological superiority justified expansion and domination (see Adas 1989, 133–98). Eventually, the entire notion of technology was co-opted by dominant Euro-American interests and indigenous technologies relegated to the dustbin of history. Recently, the political implications of technology appear in how scholars engage with it. Actor-network theory, for example, reconfigures how we understand technology and its social role. Bruno Latour (1988; 1996), in particular, is noted for arguing that technology is the locus of social interests. The fact that technologies share the human interests that are infused within them means that technologies often house both religious and scientific concerns (see Geraci 2013). In the case of material technologies, this amounts to genuine social and cultural power for religious and scientific interests. As Latour notes, "it's the power exerted through entities that don't sleep and associations that don't break down that allows power to last longer and expand further" (Latour 2005, 70).

Furthermore, the political and postcolonial observations that reshape our understanding of religion, science, and technology similarly require that we rethink the relationships of the three. Lisa Stenmark notes that the intersection of science and religion is not just about these as distinct domains but also about their implications in geopolitical contests. Stenmark (2018) notes that the Protestant Reformation, the Age of Discovery, and the Scientific Revolution combine as the context for science-religion conversations. For example, science was not simply defined against religion, but also against other, non-European, was of knowing (Stenmark 2018, 70). Colonial expansion was impossible without growing scientific and technological might. Stenmark rightfully builds on this to provoke new insights in the study of religion, science, and technology.[4] She shows, for example, how the emergence of Europe's self-conception—and

hence its political motivations and practices—was enacted through the combination of growing technological might and missionary justifications of religious exclusivity and superiority (Stenmark 2018, 73–5). One interesting conclusion, then, is to show a unique form of religion-science-technology harmony in the global pursuit of power (Stenmark 2018, 76).

These same complexities go beyond defining science, technology, or, especially, religion: they muddle our understanding of new cultural practices that seem to combine the three domains. Transhumanism, in particular, stands out as a critical movement in the religion-science-technology conversation.[5] Boris Rähme (2020) notes that a number of scholars label transhumanism religious but casts doubt on whether that is philosophically justified. Just as there are non-Christians who deny that their specific practices are "religious" (Thomas and Geraci 2018), there are transhumanists who do the same. So the very problems of definition that apply to thinking about various religions also apply to thinking about the possible intersection of religion and technology in transhumanism. Rähme prefers to label transhumanism an ideology as, he suggests, it is no more science than it is religion. This article is an effort to appreciate that muddle and provide a perspective by which it can be envisioned and described: the hydra introduces a way of thinking about the science and the religion that are present in transhumanist worldviews.

Recognizing that there are real and meaningful difficulties in assigning labels to cultural practices does not, however, absolve us of scholarly responsibilities. J.Z. Smith (1982, xi) famously argued that there are "no data for religion" because the category is created through scholarly labor, and that scholars must critically understand how they use the term and why—an opinion echoed by McCutcheon (2001, 11–12). This article is not the place to define religion or science for the reader; the hydra will not provide a clear method for establishing firm definitions of terms that have resisted definition for (at the least) decades. But scholars must acknowledge their responsibility to forthrightly express what they mean by the terms, and then work assiduously to guarantee the intellectual coherence of their efforts. Recognizing these challenges in essential terminology, it becomes easier to combine those terms and seek to make demarcations among them.

## A Brief History of Typologies

Fortunately, we can make coherent definitions for terms like religion, even though they remain open to contest; unfortunately, we are unlikely to ever form a coherent typology of religion-science-technology interactions. Despite honest and thoughtful efforts by a host of scholars, the interactions of religion, science, and technology persist in sliding outside the boundaries of categorization. It is time for scholars to move past the typologies that

have dominated work in the field. The typological approaches—necessary corrections to the conflict thesis that emerged in the nineteenth century and has refused to fade away—simply cannot do the labor their creators hope and must therefore be given up. They advanced the study of religion, science, and technology from primitive to a more advanced stage, but empirical reality remains too messy for them.

Typological approaches arose as a response to the conflict thesis espoused most dramatically by John Draper and Andrew White. In their own ways, both Draper (1874) and White (1896) believed in a battle between these two domains, though Draper's perspective was firmly antireligion while White believed that if theologians gave up their dogmatic beliefs they could benefit from the epistemological clarity of science (I will return to this in the conclusion). Intellectual opposition to the conflict thesis came as early as Robert Merton's famed PhD thesis in 1927 (published as *Science, Technology and Society in Seventeenth Century England* in 1970). But in the wake of World War II and, especially, the horrors of Hiroshima and Nagasaki it became particularly relevant for many intellectuals to move past such conflict theories and articulate a worldview that could redeem science and retain religion. Typologies offer such political reconciliations.

In the mid-twentieth century—especially under the auspices of the Institute for Religion in an Age of Science (IRAS)—a host of efforts emerged that challenged the conflict thesis and sought to create a new, modern worldview. As James Gilbert (1997, 274) shows, groups like IRAS were a reaction to the existential crisis of advancing technology and the terrors of war. Members of IRAS accomplished vital work in American culture, making it possible to hold new interpretations of religion and science (Gilbert 1997, 273–95). Among this group, Ian Barbour's influence was particularly profound. His typological approach to religion and science opened new vistas in the scholarly interpretation of religion and science (see Barbour 1997).

By proposing that the two domains could actually relate in several different ways (conflict, independence, dialogue, or integration), Barbour made it clear that life's complexity deserved greater nuance. Sometimes, Barbour's typology is implicit in a construction of religion-science interactions; for example, these basic categories undergird Ted Peters' (2018) more sophisticated illustration of movements that interpret the relations of religion and science (e.g., "scientific imperialism" or "theological authoritarianism" as two modes of conflict). Occasionally, scholars rework Barbour's terminology but maintain his basic positions (e.g., Foerst 1998; Zehnder 2011) and some scholars maintain Barbour's approach even when they find that approach inadequate to the task (e.g., Bigliardi 2012).

As a natural outcome of establishing a paradigm for study, Barbour's work came under increasing scrutiny and criticism. Geoffrey Cantor and

Chris Kenny (2001, 774) rightly pointed out that there are "complications that cannot be incorporated in simplistic taxonomies." Further, they noted that Barbour's typology was not really an analytic approach but rather a moral agenda that championed integration as the best possible outcome for society (Cantor and Chris Kenny 2001, 766). In a similar vein, Richard Olson (2011) notes that the static nature of typologies makes them ill-suited to the dynamic relationships of religion and science. Recognizing that Barbour's fourfold approach was too narrow, a variety of scholars proposed more advanced typologies in the 2000s (e.g., Stenmark 2010). These more sophisticated typologies represent a clear advance beyond Barbour's work and provide better opportunities to classify religion-science interactions.

Unfortunately, however, the entire classification effort remains hopelessly mired in sociological and historical complexity. Barbour himself recognized that only rarely do religion-science interactions fit neatly into one of his typological categories (Barbour 1997, 77). This fact was made abundantly clear in the work of John Hedley Brooke and Geoffrey Cantor. Their *Reconstructing Nature* (1998) starkly reveals the contradictions that characterize human life. Taking what they call a biographical approach, Brooke and Cantor use several case studies to show that the typical classifications (e.g., conflict or integration) might apply at one time in someone's life but not another; might apply in one arena of science or religion in a person's life, but not another; might be expressed in one aspect of a person's life but not in another. In sum, they demonstrate the fundamental incapacity of typologies to adequately address the complexity of human life and the intersections of religion and science. This is not to say that classification has no merits whatsoever. Both in teaching and scholarship, it can be productive to provide a way of approaching episodes, individuals, or interactions. As a paradigm for the relationships among religion, science, and technology, however, typological classification simply does not stand.

Just as Brooke and Cantor's biographical approach lays waste to simple classifications by pointing toward the complexity of everyday life, we should recognize that hybridity often (always?) governs the larger intersections of religion and science. As monsters are the inevitable result of category crisis (Cohen 1996, 6–7), the hydra-logical metaphor plays into our inclination to conceptualize the disrupted classifications described by Brooke and Cantor. Scholars in science and technology studies have done particular service in introducing cultural analysis to a new model of hybrid thinking. Donna Haraway, for example, argues that human life has always been characterized by boundary-crossing in human identity formation and also by mixture with technology and with nonhuman animals (Haraway 1985, 72). Bruno Latour similarly rejects the simple binaries between humanity and the natural world, arguing that scientific knowledge emerges out of both social and natural processes (Latour 1993). By now, these

interests in cyborgs and nature/culture mixtures have become commonplace in scholarship.

To considerable extent, the limits of hybridity theories for studies of religion, science, and technology are due to the way psychological or experiential dimensions often overshadow epistemological considerations. Cyborg studies generally refer to the identity of human beings more than the operations of human life. Similarly, the broader approach to theories of monstrosity: Jeffrey Biles (2013), for example, notes that our increasing intimacy with technology challenges us to think with greater clarity about ourselves. Biles explores how that intimacy draws on religious considerations (e.g., immortality, perfection, eschatology) to illustrate ways in which pop culture uncovers the psychological challenges of modernity, particularly the uneven boundary between human and machine. As important as such work is, it does not address the social structures of religion, science, and technology.

The hydra metaphor offers a pragmatism and a mythos. Pragmatically, the hydra-logical approach offers a way to conceptualize dynamic social processes as well as, potentially, internal psychological ones. It is not overdetermined by interest in the psychological boundaries of the individual but instead focuses on the real-world implications of science, religion, and technology interactions. Jeffrey Cohen notes how monsters are always embodied culture (Cohen 1996, 4); so perhaps there is a unique moment of religion-science-technology intersection that lends itself to hydra. Monstrous metaphors have a tendency to focus on the uncanny and unknown, and some scholars suggest that coping with fears about such is a primary purpose for imagining the monsters in the first place (see Cohen 1996; Asma 2009, 17; Reeves 2012). But the mythical dimension of the hydra helps us transcend that limit as well. As a monster with clearly defined heads but a mixture of motivations and behaviors, the hydra is more than a psychological ploy. It offers a magical gloss on mundane reality and it brings to bear more valances than the unknown or uncanny. The many-headed body provides a unifying principle to the confusion of the unclassifiable and in return helps us recognize our own cultural complications.

It takes little imagination to find examples of religion-science-technology interaction that disrupt typical classifications. It hardly matters what definitions we use for the terms. As noted, Barbour's work shows a clear interest in the integration of religion and science as opposed to the other relations he defines. But his concept of integration cannot be reconciled with the political reality of efforts at it. I have noted that Intelligent Design can be and ought to be seen as an effort at reconciling or integrating religion and science into a coherent worldview (Geraci 2010, 144). And yet Barbour would have been hard-pressed to defend Intelligent Design as one of his preferred metaphysical outcomes! I make this argument within the broader context of my description of "Apocalyptic AI," a

worldview that has scientific, technological, and religious elements integrated harmoniously, yet which again is unlikely to match Barbour's aspirations (Geraci 2010, 145). Indeed, transhumanist salvation more broadly poses unreconcilable difficulties to the typological paradigm: it is in conflict with some religious visions while taking advantage of others. The hydra, notes Stephen Asma, is a liminal creature, one that helps categorize the uncategorizable (Asma 2009, 40). And so we turn to this monstrous metaphor.

## A Hydra-Logical Approach

Conceptually, we must accept a more complex and more empirically accurate model for the interactions of religion, science, and technology. Historically and in the present, religion-science-technology phenomena are hydras: monsters whose many heads possess both individuality and a shared identity. Analytically, little can be gained by attempting to slice off one head (such as by debating the ethics of AI while ignoring the religious rhetoric its cheerleaders relish)—it simply re-emerges, likely multiplied in its force and significance. When I speak of a hydra-logical approach, I mean one that recognizes the centrality of complex dynamics and simultaneously accepts the logic and influence of hydras in contemporary culture. While examples could be multiplied, the widely divergent examples of robotics/AI and climate response offer clear illustration of how religion-science-technology intersections are inherently hydra-logical.

Within the domain of robotics/AI, there are several religion-science-technology hydras coursing through contemporary life. I have noted Apocalyptic AI already, but this is not the only such example. Japanese robotics, which I will briefly discuss below, have distinctly different dynamics from those denoted by Apocalyptic AI and have their own culture-specific relevance. Again, examples could be multiplied; but as these two areas have received significant attention from scholars, they offer clear opportunities to witness variation in robotic hydras.

Throughout much of my work, I have described the integration of apocalyptic perspectives into scientific and technological work, producing dreams of godlike machines and human immortality through mind uploading (Geraci 2006, 2008, 2010, 2012, 2014). An apocalyptic perspective, characterized by four key elements, drives the soteriological visions described by the roboticist Hans Moravec (1988, 1999), the AI innovator Ray Kurzweil (1999, 2005), and others who echo them. In short, Apocalyptic AI is a worldview dominated by a dualistic struggle between mind/computation and body/biology in which the latter presently rules but will be overturned in a glorious future of AI. Moravec's "Mind Fire" and Kurzweil's belief that the universe will "wake up" represent an apocalyptic faith in a future world where machine intelligence makes the

universe meaningful and allows the transcendence of human minds uploaded as immortal robotic or software agents.

My position is not without critics. Ted Peters, for example, disagrees that Moravec and Kurzweil can be truly apocalyptic given their high social status ([2008] 2011, 163). Drawing on other scholars, however, I have shown that even in the ancient world not all communities we might label apocalyptic were on the social margins (2010, 26). Elsewhere, I have been criticized for insufficient attention to questions of race, ethnicity, and colonialism (Ali 2019). I have attempted to take such criticisms seriously and have shifted my approach (e.g., Geraci 2018, 20–3).

Despite the criticisms leveled at my theory of Apocalyptic AI, the phenomena undoubtedly show the intersection of religion, science, and technology in contemporary AI. There's little reason—assuming one permits at least *some* intellectual coherence to the term religion—to question whether promises of "godlike" machines or immortal human minds are religious. Nor can one doubt there is hard science involved in the production of robotics and AI or that real technological outcomes are the result of such efforts. The prevalence of apocalyptic thinking in entertainment, industry, and pop science shows that this intersection has social credibility (i.e., widespread usage) thanks in part to its hydra-logical status. As religion-science-technology hydra, Apocalyptic AI gains authority through a variety of political strategies and has clear influence in twenty-first-century life. While many scientists in robotics and AI take little if any note of apocalyptic promises (Geraci 2010, 45–7), their work is nonetheless bound up with those utopian dreams. Even sober-minded pragmatists mention apocalyptic dreams in their analyses of robotics and AI (e.g., Perkowitz 2004, 186, 209; Wallach and Allen 2009, 190–4; Nourbakhsh 2013, 106–7; Kaplan 2016, 138–55; Hussain 2017, 36–7; Nourbakhsh and Keating 2019, 37, 67).

Thinking of Apocalyptic AI as a hydra means recognizing that there are inseverable relations among religion, science, and technology: these heads cannot be definitively described along the conflict-harmony axis that underwrites typologies of religion and science. After all, in some sense, Apocalyptic AI shows religion and technology with one goal: the Singularity. In another sense, that goal stands in conflict with a host of other religious aspirations, such as the Protestant doctrine of salvation: *sola fide, sola scriptura*. A religion-science-technology hydra, such as Apocalyptic AI, might engage in labors that we consider a harmony of religion and science while simultaneously engaging in labors that do quite the opposite. The heads of a hydra do not necessarily work in tandem!

Other analyses of robotics/AI show that Apocalyptic AI is not the only hydra in the waters (or perhaps we are simply seeing more heads on the same beast). In Japan, expectations are decidedly more mundane and pragmatic than in the promises of techno-futurists like Kurzweil, but

nevertheless Japanese religious traditions play a role in the description and deployment of robotics there. Timothy Hornyak (2006, 29–40) describes a longstanding Japanese integration of Buddhist imagery with robotic technology, one that traces to the early twentieth century; and Frederick Schodt (1988, 196–7, 210–11) describes late century intersections between Shinto, Buddhism, and robotics. Given the complications that arise when we consider religion, science, and technology from international perspectives, the hydra-logical approach accepts that the classifications generally employed are provincial (i.e., emergent out of western, Christian perspectives) and that other perspectives might emerge from non-Christian cultures.

More recently, Takeshi Kimura has employed tools from science and technology studies to show the significance of robotics/AI for the sociology of religion in Japan. On the one hand, Kimura argues that even in cases where religious interactions are "not obvious" (2017, 9), new versions of religion and myth emerge around advancement in robotics, especially as these challenge traditional concepts of human personhood (Kimura 2017, *passim*). More specifically to Japan, Kimura shows ways in which religion can infuse robotics. For example, he notes that the roboticist Masahiro Mori—well known for his claim that robots may possess "Buddha nature" (Mori [1981] 1999, 13)—has "several books on the teaching of Buddhism, not as a Buddhist scholar or as a Buddhist monk, but as a robotics engineer and a lay Buddhist" (Kimura 2018, 73). Already, something interesting, perhaps unique, is obvious here: Mori has used his scientific positioning to author traditionally religious texts. Additionally, Kimura notes that for Mori Buddhism could be a resource for innovation in robotics (Kimura 2018, 74–5) and that Mori believes a "secular, engineering-based, and non-religious" robotics design contest can produce Zen experiences even without the participants realizing it (Kimura 2018, 76–7).[6] These religious intersections no doubt contribute to the identification of Japan as a "robot nation"—a label that is the result of active policy decisions and communication strategies (see Šabanović 2014). A religion-science-technology hydra can thus have demonstrable public significance on national as well as individual levels.

As a second example, we might better describe contemporary climate response as a hydra than as some typologically demarcated position or set of positions. Of course there are many elements of climate science and response, which have little if anything to do with religion (just as there are efforts in robotics and AI likewise distant); but we are here interested in the points of intersection, in the ways that religion, science, and technology intertwine in climate science and response. Scientists and theologians find themselves connected to one another whether they like it or not. These connections are intricate when viewed from a distance or up close.

A recurrent theme for scientists and theologians working on public climate response has been finding common ground, though such efforts can be undermined by political considerations. Overall, environmentalism and climate response create space for the entanglement of different motives and practical realities. As Jenkins, Berry, and Kreider (2018) describe, the intersections of religion and climate change do a variety of different kinds of work: for example, reconfiguring conventional understandings of religion, participating in internecine conflict, establishing new worldviews (often in potential opposition to traditional ones), and challenging political regimes that have suppressed sovereign indigenous authority in tribal lands. In sum, efforts to unite religion and environmentalism in common cause have taken a variety of approaches and, more importantly, are not the only ways in which religion and environmentalism or climate response interact in the daily and political lives of people. When we add the difficulties posed by internal differences, such as those among different groups of Christians, we find that articulating "the" Christian climate response impossible to articulate and are light-years from classifying that hypothetical response within a typology.

The complexity of religion-science-technology interactions is strikingly obvious in the example of evangelical Christianity. Such Christians are often lambasted for ignoring environmental degradation in their fervor for a Second Coming: for example, a Pew Research Center poll (2015) indicates that only 28% of evangelicals believe that climate change is primarily driven by human consumption of fossil fuels. Opposition to climate science appears in evangelical literature, politics, and organizations (Ronan 2017). As such, many critics argue that evangelical Christianity is antithetical to environmental protection. Indeed, to advance their objection to the teaching of evolution, many evangelicals have rejected climate science and supported the introduction of "scientific controversies" curricula in schools using climate science as a tug boat to bring criticisms of Darwin in its tow (see MacKenzie 2010; Harball 2013; Strauss 2017; Chen 2018). This association may actually account for evangelical resistance to climate change better than the association of Rapture theology and environmental degradation.

And yet, the conflict interpretation might not always reflect the lived experience of evangelical Christians (see Neff 2008). Dawn Stover argues that, globally, evangelicals ardently support climate care and that in the United States, where support is more muted, they are increasingly turning to proenvironment advocacy (Stover 2019). She argues that opposition to climate action is typically not faith based, but often has other political valences (Stover 2019, 68, 69). Leveraging climate denial as resistance to the teaching of evolution offers an obvious example of this. The Evangelical Call to Civic Responsibility, published by National Association of Evangelicals in 2004, offers only modest support for environmental work

(compared to its typical enthusiasm for antiabortion politics and opposition to gay marriage) but it was on the leading edge of "creation care" in twenty-first-century churches. This environmental work by local congregations includes recycling, efficient resource usage, and, especially, organic gardening (see Rossi 2008). Thus the evangelical approach to the environment includes seemingly contradictory ways of looking at environmental stewardship. Indeed, Jenkins, Berry, and Krieder (2018, 9.3-9.4) review a wide array of contradictory findings regarding evangelical Christian concerns and climate response.

Contradictions are not limited to evangelical Christians, of course. Famed biologist E.O. Wilson addresses his book *The Creation* to an anonymous Southern Baptist pastor whom he hopes will join him (despite his own departure from the faith) in an effort to save Earth from environmental disaster. Wilson speaks fervently of collaborating with religious believers (2007, 3–8); but *The Creation* does as much to alienate these as it does to find common ground with them. After offering pragmatic reasons for environmental protection, Wilson turns to the "goals of biology," which include explaining the origins of life (without divine intervention), synthesizing new lifeforms, explaining human beings through purely mechanistic means, and creating AI minds (Wilson 2007, 106–7). It would be easy for the Southern Baptist to accuse Wilson of playing God or attacking religion! Moving on, Wilson finishes by correctly, but unnecessarily, lambasting Intelligent Design (Wilson 2007, 166–7). Certainly, natural selection is among the most robust theories in all of science and Wilson accurately identifies popular trends in biology. But it is hard to imagine how calling all this to mind will advance his effort to collaborate with the hypothetical Baptist preacher. Ultimately, the political aspirations of *The Creation* are helplessly muddled by controversy and contradiction and no amount of nuance will allow us to cleanly situate Wilson's effort along a conflict-harmony axis or in a fourfold, eightfold, or any other typological schema.

Meanwhile, Catholic thinkers have offered recent support for environmental action but that support comes with repercussions. Twenty-first century Catholic theologians tend to support environmental protection and do so within a Biblical framework that emphasizes stewardship and alignment with the social values of Jesus that reject consumer capitalism (e.g., L. Johnson 2005; E. Johnson 2014, 5–6). In the encyclical *Laudato si'* (2015), Pope Francis echoes the call to conversion that theologians articulate: the encyclical challenges the dominant economic and commercial models and suggests seeking a more inclusive, less exploitative, relationship with the natural world. As one might expect, Francis speaks of spiritual *and* scientific *and* technological realities and puts these at the service of ecological restoration and social progress, including a section explicitly dedicated to "religions in dialogue with science" (Francis 2015, 145–8). Meanwhile,

there is evidence that the encyclical had *both* positive and negative impacts on environmental thinking (see Jenkins, Berry, and Krieder 2018, 9.4)!

So far, the efforts described seem to place Catholic environmentalism and climate response cheerfully in the integration class of religion-science efforts,[7] but I have been at pains to state there are almost always deeper complexities and this is true of Catholic climate response efforts also. One clear example comes from the U.S. politician Rick Santorum, a Catholic, who adamantly insists the Pope should steer clear of scientific issues (see Terkel 2015). While the logical inconsistencies in Santorum's position are obvious, he is not alone in arguing that policymakers are entitled to ignore scientists and activists or that religious leaders should avoid taking up common cause with them. The complex fashion in which Francis cites earlier, more conservative popes like John Paul II and Benedict, further reveals his careful political labors: Francis clearly recognizes the broader political implications of his position in the Church and works to smooth over potential conflicts. Pushing the Catholic climate response even further from the realm of easy classification, the Episcopal priest Matthew Fox (formerly Catholic, but expelled from the Church) has taken up *Laudato si'* and seeks to build a new "Order of the Sacred Earth," a political and religious group that transcends denominations by aligning the moral, spiritual, and scientific necessities of climate response (see Fox 2018). While Fox draws on Catholic theology—and Christian theology more broadly—to build a coalition in defense of the environment, there are political implications of both his nondenominational order and his relationship to both the Catholic and Episcopal communities that indicate the hydra-logical nature of Catholic climate response and thus climate response more generally.

As a final note on the complex interplay of religion, science, and technology in climate response, I wish to point toward geoengineering as a locus in which these three cultural domains find intersection. The potential for cataclysmic climate change leads some people to propose that we must engage in massive geoengineering projects that would repair the landscape, limit exposure to sunlight, filter the atmosphere, or otherwise ameliorate the environment on a global scale. Alexander Ornella (forthcoming) argues that carbon capture technologies are a perfect example of how religion, science, and technology intersect. As noted above, environmental movements can take on a religious affect; Ornella argues that carbon capture advocates reshape the eschatological fear of environmental collapse through a promise of technological salvation. Those who market carbon capture technologies argue that the very toxin poisoning the earth (carbon dioxide) can be utilized as a source of infinite energy production, thus permitting a true carbon-neutral energy supply and the instauration of a paradisiacal new world. Their own advertising draws on moral structures,

cosmic renewal, and the search for transcendence—all secular versions of traditional Christian approaches to technology.[8]

Much like Apocalyptic AI, geoengineered salvation is a form of what the Fondazione Bruno Kessler (FBK) calls a "religion of innovation." The Center for Religious Studies at FBK identifies three conceptual interactions between "religion" and "innovation": (1) innovation in religion, (2) religion in innovation, (3) religion of innovation (Center for Religious Studies 2019). The first refers to changes taking place in traditionally religious communities. The second describes ways in which religious communities and individuals contribute to technological innovation through their advocacy or direct participation. The religion of innovation refers to how "the vocabulary of innovation itself [may have] become a rhetorical vehicle for quasi-religious discourses" and the possibility that innovation has "turned into a belief system and become a sort of religion" (Center for Religious Studies 2019, 7). Drawing upon intellectual habits gleaned from religion, those who construe technology as twenty-first-century salvation have produced a secular religion inoculated against scientific critique. Sociologists Bainbridge and Stark (1985) predicted that precisely such traditions would emerge in the late twentieth century. Their prescient expectation is now fulfilled in Apocalyptic AI, geoengineering, cyborg transcendence, biotech raptures, and more. The religion of innovation has thus become a major player in contemporary culture.

The religion-science-technology hydras of twenty-first-century life refuse easy classification; indeed they vigorously stomp from one category to the next, occupying them simultaneously with ease. To understand the political and cultural implications of these interactions requires that we accept their own logic. While it might be occasionally (at most!) necessary to narrowly describe the interactions in ways that resemble typological classification, such efforts must always recognize the hydra-logical nature of reality. When we act on simplifications, we create more problems in the long term. As such, scholarship investigating religion, science, and technology must acknowledge their multiheaded, but singular, constitution.

## Conclusion

One might argue that the approach described here reinscribes the typologies it critiques; but this would be missing the logic of the hydras. As a critique, it could be suggested that I have labeled certain religious efforts (e.g., differing evangelical Christian perspectives) as conflict or cooperation with scientific efforts. It would then appear that the hydra is just there as a container for typological categories. This interpretation, however, misses the point. The hydra-logical approach demands that we examine religion, science, and technology as they romp through the world—it is about their engagements with one another and with broader culture. It requires that

we describe the interactions and outcomes without prior commitment to how these can appear in public life.

Arguably, it is the focus on typologies and classification that leads to such widespread miscomprehension of even some of the most widely cited actors in the history of religion-science-technology hydras. For example, scholars almost unanimously see narrow-minded advocacy of the conflict thesis in Andrew White's *History of the Warfare between Science and Theology in Christendom*. For example, despite having a wonderfully sophisticated approach to the history of science and religion, Peter Harrison states that "both Draper and White insisted that science and religion were enduring and opposed features of Western history and of styles of thinking" (2015, 173). And yet, White himself argues in favor of harmony: his concerns are political—Cornell University is under assault from theological forces (1896, vi-viii)[9]—and his solutions favor the persistence of Christianity, but a Christianity that welcomes doctrinal revision through scientific progress ([1896] 1993, Vol. 2, 394–6). The multiple heads of hydras give us a better way of seeing this essential fact about White's labors just as they do in the AI and climate response examples given above.

In their critique of Barbour's typology, Cantor and Kenny note how the privileging of belief in Barbour's work (a bias extant in almost every typological classification) implies it may be particularly weak for understanding religions more invested in ritual practices, cultural affiliations, or other modes of religious being (Cantor and Kenny 2001, 778–9). Overemphasis upon belief as the central component of religious life quite possibly invents many of the conflicts that supposedly occupy the terrain of religion and science. Not only might the lived experience of religious practitioners bear little resemblance to the shibboleths that dominate media discourse about religion and science, but the policy implications of religion-science-technology hydras surely amount to much more than questions of what people believe. For example, the way people use AI in commercial, industrial, and military applications seems to transcend the question of what people believe about gods or the ontological basis of morality. Many traditions simply do not emphasize belief as a principal mode of participation. We must describe how these traditions participate in our cultural sphere and account for them in our observations and theoretical descriptions.

This article is first and foremost an attempt to move scholars of religion, science, and technology away from typological classifications that remain influential (simultaneously suggesting a political explanation for that influence); but the examples taken demonstrate a certain need for hydralogical perspectives elsewhere. It is not just theologians like Pope Francis who speak about religion, science, and technology as a unified effort. Even atheist scientists in computing use religious metaphors and make religious claims about their work. Ray Kurzweil comfortably describes the apotheosis of humanity and the cosmos (Kurzweil 2005, 476) and Moravec

sprinkles religious references throughout his writing (e.g., 1999, 143). Anthropologist Stefan Helmreich ([1998] 2000, 83–5, 194–7) has shown how researchers in Artificial Life regularly use religious metaphors and often recognize religious implications of their work. The hydra-logical approach gives us a way to view such claims and understand what is happening in theological and scientific spaces. This has implications for industrial and government policymakers. Google's internal crisis over AI ethics, for example, is one that would benefit from this approach.

This article is a call to reconsideration: scholars must accept empirical reality as it is rather than forcing it into narrow boxes that tell too little about the world or serve political regimes. The hydra-logical approach recognizes complexity first and foremost. Doing so helps correct our bias toward belief and simultaneously gives us better access to the political and cultural outcomes of religion-science-technology interactions. Wrestling with the hydras constituted by those interactions opens new opportunities for understanding, but also opportunities for intervention in public life. Looming catastrophes—whether in immediate future of climate change, species loss, the economic repercussions of automation, and military AI or the long-term forecasts of robotic conquerors and genetically engineered superhumans—the public is in need of sage counsel. Academics who take a long look at religion-science-technology hydras may find themselves in a position to provide it.

## About the Art

The hydra cave art pictured in Figure 1 is a mash-up of cave paintings from Chauvet, France, and original art produced by J.R. Maloney of Vanguard Tattoos in Nyack, NY. By stylizing the hydra in cave art, Maloney hints at the antiquity of intersections among religion, science, and technology while simultaneously revealing the inherent comfort of humanity with complexity and contradiction.

## Notes

1. I am grateful to Richard Olson, whose published work (2011, 69–70) reveals I am not alone in this!
2. On the Galileo Affair, see Brooke (1991); Brooke and Cantor (1998, 106–52); Biagioli (1993); and Feyerabend ([1975] 2001, 54–134) for a variety of interpretations that undercut the run-of-the-mill conflict narratives.
3. For my part, I use Chidester's definition of religion—that it is "the negotiation of what it means to be human with respect to the superhuman and the subhuman" (see Chidester 2004, 17).
4. I am in complete agreement with Stenmark on this issue and have written on it elsewhere (Geraci 2018).
5. While a host of definitions for transhumanism exist, they largely coalesce around the idea of using technology to radically transcend human limitations (e.g., genetic engineering, nanotechnology, cyborg enhancements, mind uploading).

6. Kimura notes that when Mori took up his study of Buddhism "most people thought that Buddhism and robotics had nothing in common" (Kimura 2018, 76). This sentiment strikes an odd chord, however, given the history detailed by Hornyak (2006).
7. Or in what Elizabeth Johnson calls "practical cooperation" as an addition to Barbour's typology (see E. Johnson 2014, 11).
8. On Christianity and technology, see especially Noble (1999).
9. Oddly, this introduction does not appear in some contemporary versions of White's text, including the version I use for volume 2 ([1896] 1993), which I employed because I own only volume 1 of the original printing.

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