Artificial Intelligence and Apocalypticism

with Robert M. Geraci and Simon Robinson, "Introduction to the Symposium on Artificial Intelligence and Apocalypticism"; Beth Singler, "Existential Hope and Existential Despair in AI Apocalypticism and Transhumanism"; Michael Morelli, "The Athenian Altar and the Amazonian Chatbot: A Pauline Reading of Artificial Intelligence and Apocalyptic Ends"; Victoria Lorrimar, "Mind Uploading and Embodied Cognition: A Theological Response"; and Syed Mustafa Ali, "'White Crisis' and/as 'Existential Risk,' or the Entangled Apocalypticism of Artificial Intelligence."

MIND UPLOADING AND EMBODIED COGNITION: A THEOLOGICAL RESPONSE

by Victoria Lorrimar

Abstract. One of the more radical transhumanist proposals for future human being envisions the uploading of our minds to a digital substrate, trading our dependence on frail, degenerating "meat" bodies for the immortality of software existence. Yet metaphor studies indicate that our use of metaphor operates in our bodily inhabiting of the world, and a phenomenological approach emphasizes a "hybridity" to human being that resists traditional mind/body dichotomies. Future scenarios envisioning mind uploading and disembodied artificial intelligence (AI) share an apocalyptic category with more traditional religious eschatologies, though they differ markedly in content; therefore, the insights of embodied cognition and their uptake in technological innovation are considered as they apply to theological concerns. Theology often functions in debates over the technological future to critique or to caution. However, theologians may learn from their technological dialogue partners when it comes to the future of embodiment and its implications for the construction and practice of theology.

Keywords: artificial intelligence; embodied cognition; mind uploading

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The idea of the transhuman has captured the public imagination, and is no longer cloistered in the elite circles of futurists, science fiction, and sci-fi fandom. To give one example, in March 2018 Gucci launched a fashion show named "Cyborg." It was described by *Vogue* as "a procession of transhumans, walking in trancelike step through a suite of operating

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theaters: Bolted together from the clothing of many cultures, they were . . . a metaphor for how people today construct their identities—a population undergoing self-regeneration through the powers of tech, Hollywood, Instagram, and Gucci."[1]

"We are the Dr. Frankenstein of our lives," head designer Alessandro Michele is quoted as saying, "We exist to reproduce ourselves, but we have moved on. We are in a posthuman era, for sure; it is under way." He was inspired by his reading of the feminist philosopher Donna Haraway's [1985]1991 essay "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century." When fashion giants start batting around terms like "posthuman" and "cyborg," we might safely say that these concepts have pretty well infused the public imagination.

Vogue got it wrong though, when they described the show as a procession of "transhumans."[2] But why reject a "transhumanist" association in the context of fashion? Because the fashion industry is inescapably corporeal. Clothing highlights the body, or perhaps the body highlights the clothing. Yet in certain spheres of transhumanist thought and enthusiasm for AI, the body is not so valued.[3] In both future visions of a general AI, and in transhumanist proposals for "mind uploading," we see projected an intelligence that transcends our present embodiment. These scenarios are located within a broader tendency toward apocalypticism inherent in transhumanist philosophy—whereas traditionally the idea of apocalypse has been more often associated with religious anticipation of the end of the world and order we presently inhabit (e.g., as in Christian eschatology), technological apocalypticism anticipates a radical transformation of our present existence by technological means.[4]

Hans Moravec, former director of robotics at Carnegie-Mellon University and developer of advanced robots for both NASA and the military, popularized the idea of living perpetually via a digital substrate. In his 1988 work *Mind Children*, he envisioned a procedure in which the entirety of the information encoded within the neurons of a human brain could be read, copied, and uploaded to a computer (109). Rather than a radical extension of biological life, romanticized in historical immortality myths, this approach seeks immortality through software existence.

Another transhumanist advocate, Ray Kurzweil, considers mind uploading to be a likely scenario, picturing a point in the future at which "we will have effectively uploaded ourselves, albeit gradually, never quite noticing the transfer" (2005, 202). Apart from increased longevity, mind uploading also pursues the goal of greater intelligence through escaping the limitations of the biological, degenerating brain. Personal identity and memories can be "backed up," and the uploaded mind would benefit from running on a more efficient "compiler" (Koene 2013, 147–48).

This vision relies on a material understanding of the self, thus allowing replication on a computer model, and it is common for "uploaders" to use the language of information technology in describing the human brain.[5] This computational model of the brain and its cognition was first articulated in the 1950s by John von Neumann (1958), and has been a prevalent paradigm in cognition studies (Rescorla 2017). Moravec captures the prevailing attitude toward the body taken by proponents of mind uploading. He defines human being as "the *pattern* and the *process* going on in my head and body, not the machinery supporting that process. If the process is preserved, I am preserved. The rest is mere jelly" (1988, 117, emphasis original).

We see a similar view of the body in some elements of science fiction. When Case, the protagonist in *Neuromancer*, dismisses the biological body, unaugmented and disconnected from cyberspace, as "meat" (Gibson 1984, 6), he sounds a lot like certain transhumanists (e.g., Moravec, 1988). Mark Dery sums up this attitude to the flesh characterized by cyberpunk fiction and mind-uploading proponents: "It's the body's job to be a symbol of detestable putridity in the eyes of an information society characterized by an exaltation of mind and a contempt for matter, most of all the body—that aging, earth-bound relic of Darwinian evolution that Net junkies refer to as meat" (1999, 142). This disdain for the body is reflected not only in depictions of bodily augmentation, but also in more extreme fictional mind-uploading scenarios. Richard Stallman (2012) writes a short story that might even be read as a utopia, in which a human gradually shifts more of his existence onto a virtual platform as his relationship with a virtual "soul mate" progresses, only to experience a fuller joy than he could ever have imagined once the upload is complete.

So, we have certain streams of thought in which the biological body is derided as "meat" or "mere jelly," something that ought to be discarded either in favor of something more physically robust, or perhaps even *no* body. Whether we are talking about uploading our own minds to a digital substrate, or the related prospect of developing a general artificial intelligence, we might want to think some more about what the body "brings to the table" so to speak, when it comes to intelligence. The remainder of this piece will consider insights from the closely related fields of metaphor studies, phenomenology, and embodied cognition and the way in which they are influencing some strands of robotics and AI research, with a view to challenging the theological community to consider how future changes in embodiment may impact theological concerns such as worship and theological construction. In responding to the enhancement aspirations of transhumanists, theologians might learn from the ways in which roboticists are attending to our embodiment, even as they explore the impact of novel bodily configurations and experiences.

Metaphor and Embodiment

George Lakoff and Mark Johnson's extensive research into the neuroscience of metaphor underscores the embodied nature of cognition. In *Metaphors We Live By*, they demonstrate from a range of research perspectives that metaphors operate unconsciously, at the level of concept rather than just language, and are fundamentally embodied. They summarize one aspect of metaphor in understanding that resists linguistic articulation: "our metaphors will reflect our commonplace experiences in the world. Inevitably, many primary metaphors are universal because everybody has basically the same kinds of bodies and brains and lives in basically the same kinds of environments" (1980, 257).

Psychologist Iain McGilchrist highlights the embodiment and foundational nature of metaphor as "the *only* way in which understanding can reach outside the system of signs to life itself" (2009, 115, emphasis original). "Everything has to be expressed in terms of something else, and those something elses eventually have to come back to the body" (McGilchrist 2009, 116).

Well-known examples in the field of metaphor and embodied cognition illustrate how our bodily relation to the world is embedded into the very language we use. For example, the notion that "affection is warmth" encodes the idea that when we give and receive affection through physical contact, we are warmed, and this experienced change of temperature echoes in our language. Thus, we do not literally interpret statements such as "she gave me the cold shoulder" or "we received a warm welcome." Complicating factors, more than one physical experience can be associated with a concept. Affection is also related to proximity, for example, thus we say things like "we're very close" or "he's been distant lately." Another common metaphor is built around the idea that "up is more." We apply it to all kinds of abstract ideas—we "climb" the career ladder, the stock market "plummets," for example. But these abstractions are also derived from a more direct physical experience. If we fill a glass with water, we see the level rise. There is a correlation between height and volume. Lakoff and Johnson look at a range of common concepts such as these and show how time and time again "Abstract concepts arise via metaphorical projections from more directly embodied concepts" (1980, 497).

The demonstration that bodily metaphors operate at both language and conceptual levels highlights the complexity of the interface between linguistics and cognition. The relationship between language and cognition remains disputed, but recent scholarship suggests that they are more entwined than classical models would have us believe (Ünal and Papafragou 2018). The details of how language and cognition are related are beyond the scope of the present article; however, the examination of embodied cognition and its implications for future scenarios in which human embodiment

undergoes drastic alteration understands language to be a component of cognition, rather than an entirely separate domain. This is not to suggest that the majority of metaphors are embodied by necessity, and future metaphors may develop that have no physical dimension; however. our present language and cognitive processes are deeply embodied.

The field of phenomenology also investigates the embodied dimension of human cognition. Our intellectual reflection is preceded by preconscious, bodily perceptions of the world. Maurice Merleau-Ponty, for example, refers to "preconscious knowledge," which in turn borrows much from Heidegger's "being-in-the-world" (Merleau-Ponty [1945]1962, 92; cf. Smith 2013, 43–44). This attests to the "hybridity" of human being, challenging both Cartesian and animalist dichotomies of mind and body (Smith 2013, 43). Given the hybrid fashion designs described above, it would not be surprising to find that Gucci designer Michele had been reading French phenomenology in addition to Haraway's posthumanism.

Sociologist and anthropologist Pierre Bourdieu explores embodiment and practices in the establishment of *habitus*, dispositions he defines as "embodied history, internalized as a second nature" (1990, 56). Bourdieu names a "prelogical logic of practice" in his critique of theoretical reason and highlights the difference between this concept and a more objective notion of logic "which is inherent in intellectual activity and the intellectual condition, is no doubt what intellectual discourse has least chance of accurately expressing" (1990, 19). Nevertheless, a "logic of practice" moves past the intellectualism/voluntarism divide by rejecting both: against the former it asserts that a practitioner's relationship to practice cannot be reduced to theory, and against the latter it refuses to accord radical autonomy to a "rational" subject in decision making (Smith 2013, 79). Similarly, Bourdieu's conception of *habitus* becomes "a way to break out of false dichotomies between freedom and determinism, intellect and instinct" (Smith 2013, 85). The dualism between mind and body in cognition, or the distinction between reason and affect or imagination could be added to this list of dichotomies.

Language itself is a major contributor to the problem of dichotomy, which complicates the attempt to sufficiently articulate an account of human cognition without dichotomizing its various components. James K. A. Smith highlights the dualistic and reductionistic character of our lexicon in philosophical anthropology. The likes of Bourdieu and Merleau-Ponty, in attempting to honor "the messy complexity of our being-in-the-world that is *between* all these [linguistic dichotomies]," struggle to find sufficient language to describe what they mean by a *betweenness* (and thus Bourdieu resorts to the archaic term *habitus*) (Smith 2013, 85). But it is these notions of betweenness that we need if we are to articulate the role played by the body and the broader physical environment in cognition. The growing field of embodied cognition recognizes the hybridity of human being and its

implications for cognition, exploring the centrality of the body for human thought, and thus we turn to it next as an additional resource for reflecting on the future of embodied existence.

Embodied Cognition

The mind-body problem is often the starting point for critiques of insufficiently corporeal models of human cognition, yet these critiques run the risk of being too vague when it comes to the actual role played by the body in shaping the mind (Edelman 1993, 3–15). The field of embodied cognition concentrates on precisely this question, exploring the specific ways in which the mind and body interact. Embodied cognition studies challenge traditional approaches to cognitive science, which have tended to separate out the role of the body as merely providing the sensory input and output for the cognitive processes of the mind.

Embodied cognition as a field of enquiry derives in part from the phenomenological and metaphor studies discussed above. It draws on diverse fields such as philosophy of mind, neuroimaging, and experimental psychology, as well as extending into areas such as robotics and artificial intelligence research. Embodied cognition positions itself against both behaviorism, which focuses on external and measurable responses to stimuli, and its opposite, cognitivism, which instead makes inferences about mental patterns and processes. It recognizes that cognition is "deeply dependent upon features of the physical body of an agent," and that "aspects of the agent's body beyond the brain play a significant causal or physically constitutive role in cognitive processing" (Wilson and Foglia 2017).

Although cognitivist approaches tend to equate the central cognitive processing unit with the brain, embodied cognition highlights the decentralized aspects of our mind's operations. Precisely how the body contributes to cognition is up for debate, with scholars interpreting embodiment in myriad ways. Lawrence Shapiro (2011, 4) offers a helpful overview, grouping approaches to embodied cognition into three separate hypotheses: conceptualization, replacement, and constitution. All of these hypotheses challenge assumptions inherent in cognitivism. The conceptualization hypothesis highlights the connection between our concepts and our mental representations, and our sensorimotor systems (Shapiro 2011, 70; 2008, 67–68), countering a computational model of the mind that sees sensory information merely as input to an otherwise disconnected processor. The replacement hypothesis of embodied cognition argues for an even more direct relationship between the body and the environment, diminishing the role of intermediary mental representation (Shapiro 2011, 114–15). The constitution hypothesis is similar to Andy Clark and David Chalmers's (1998) notion of the "extended mind," and incorporates external objects into the mind's physical substrate.

These proposals are not mutually exclusive, but layer together in a nuanced, and still evolving, account of the relationship between mind and body. Mark Johnson (2008) identifies five intertwined and irreducible dimensions of human embodiment: the biological, ecological, phenomenological, social, and cultural. Clark summarizes the embodied nature of cognition well in his assertion that human brains "are not the brains of disembodied spirits conveniently glued into ambulant, corporeal shells of flesh and blood. Rather, they are essentially the brains of embodied agents capable of creating and exploiting structures in the world" (1997, 219). We ought, therefore, to think in terms of "brain-body-world systems" (Clark 1997, 215).

Before turning to the implications for mind uploading, it is worth considering the empirical support for embodied cognition when compared with traditional accounts of cognition. The mind remains elusive when it comes to obtaining physiological data, but neuroimaging is providing insights into the structure of the brain that lend increasing weight to the embodied character of cognition. Functional magnetic resonance imaging (fMRI) studies performed while the brain is at work indicate patterns of activity that are less consistent with the modular structure anticipated by a cognitivist model; rather multiple brain structures are involved in ways that defy neat categorization.[6] Mirror neurons in our brain appear to respond to certain bodily movements, not only in ourselves, but when we see others perform those actions (Rizzolatti and Craighero 2004). The notion of the extended phenotype developed in evolutionary theory prompts us to understand the mind as an entity that is inextricably linked with the body, again supporting embodied cognition against earlier conceptions of cognition (Clark and Chalmers 1998, 98). Nevertheless, we must be careful not to prematurely discard the entirety of traditional cognitive theory in favor of embodied cognition; it may turn out that insights of embodied cognition can enrich and complement earlier theoretical models. For the present purpose, it is sufficient to acknowledge that cognition is grounded in the body in a stronger sense than has generally been recognized.

These caveats notwithstanding, it is fair to say that mind-body dualism has been challenged convincingly on a number of fronts, to the extent that it is a pretty hackneyed critique by this point. Hackneyed or not, however, it is a critique that keeps coming up in intelligence studies. N. Katherine Hayles recounts the story of "*how information lost its body*, that is, how it came to be conceptualized as an entity separate from the material forms in which it is thought to be embedded" (1999, 2, emphasis original). Given that our capacity to "know" is bound up in our embodied existence, the more radical proposal of mind uploading exposes some concerns. What would jettisoning the body do to our ability to make sense of our world? This also raises questions as to how a radical

morphological freedom and diversity as a result of enhancing technologies might impact our present ability to comprehend the world and the other.

Hayles raises a similar critique of mind uploading in her response to Moravec's *Mind Children*: "How, I asked myself, was it possible for someone of Moravec's obvious intelligence to believe that mind could be separated from body? Even assuming such a separation was possible, how could anyone think that consciousness in an entirely different medium would remain unchanged, as if it had no connection with embodiment? Shocked into awareness, I began to notice he was far from alone" (Hayles 1999, 1). Admittedly, Moravec does not represent consciousness as forever unchanged in an uploaded state, but argues that over time uploaded existence would diverge from prior human existence. Hayles's critique is valid at least in the initial stages of upload, however, as systems continue prior processes in the period before adaptation occurs.

Of course, advocates of mind uploading have recognized these concerns. Kurzweil thus argues that "a reinstantiated mind will need a body, since so much of our thinking is directed toward physical needs and desires" and imagines a virtual human body "version 2.0" (2005, 199). Nick Bostrom (2003) makes a similar case for the use of simulated bodies that would permit uploads to experience the same sensations as a "regular" human body via virtual reality.[7] There is also the notion of "extended cognition," mentioned briefly above, already operative as we augment our minds with tools and other devices, and the plasticity of the brain and its relationship with the body that allows for the possibility of new forms of embodiment. Andy Clark describes the human self as "a constantly negotiable collection of resources easily able to straddle and crisscross the boundaries between biology and artifact" (2013, 124). The agent/world boundary is reconfigurable; human-machine interfaces are the outworking of a biological plasticity that humans have always enjoyed (Clark 2013, 125).

Communicating with Disembodied Beings

We have mainly been focusing on how our bodily existence affects the way that we *think* and make sense of the world. The metaphors highlighted as examples are linguistic ones. Of course, the way in which we *communicate* also relies on these linguistic patterns, but then we have the added dimensions of nonverbal gesturing and body language to contend with. Arguably, much of our reflection on artificial intelligence and communication has focused on these more obvious physical components. In fact, the reality of our imaginations being tethered to our bodily relations to the world means we may not even be capable of meaningfully imagining an entirely disembodied uploaded existence. It is perhaps not trivial that fictional uploaded minds tend to still adopt virtual bodies of some sort.

The embodied metaphor examples given earlier seem relatively straightforward—an uploaded mind will at least retain the memory of the body it once possessed, and these metaphors will continue to make sense as a result (similar to the way in which those who become deaf later in life tend to retain the speech patterns they learned while their hearing was intact). Perhaps, we can just program a workable (though disconnected from its original bodily context) version of such metaphors into disembodied AI, or AI can learn their meaning through exposure to their usage. But cognition and language continue to evolve, and new embodied metaphors can always develop. We see this emerging with certain technologies already—the notion of "swipe left," for example, is entering our language in particular contexts.

Ironically, our affinity for metaphor has underscored some of these problematic conceptions of human cognition. The "mind as computer" metaphor is a familiar trope, and one that does not directly depend on a bodily experience of the world. Jerry Fodor, in his influential work, went as far to describe the computational theory of mind as the "only game in town" when it comes to cognition studies (1975, 27). But in this understanding we see the way in which technological advances are already influencing our understanding of intelligence. Lakoff and Johnson point out that a logical "consequence of the [brain as computer] metaphor was that the hardware—or rather 'wetware'—was seen as determining nothing about the nature of the program" (2003, 75–76). It is not surprising, therefore, that the body has often been neglected in the study of the mind.

And there is a further irony: while some advocates for transhumanism are looking to escape embodiment via a mind-uploading process, many of the AI scientists that transhumanists perceive as allies are turning emphatically *toward* the body in their work.[8] AI researchers are recognizing the centrality of embodiment for cognition, and taking this into account in their technological development. In fact, artificial intelligence is one of the strands of enquiry that feeds into the broader field of embodied cognition. Matej Hoffman and Rolf Pfeifer (2012), for example, have experimented with embodied AI, demonstrating a greater ability to process information in robots able to interact with the environment through movement and various sensors. Embodiment was a key priority in MIT researcher Rodney Brook's AI development.[9] Noel Sharkey and Tom Ziemke (2001) question whether robot embodiment might produce the sought-after "strong" AI (though they answer in the negative, their question reveals the priority of the body in their research). The burgeoning field of embodied robotics issues a direct challenge to computational and cognitivist models of the human brain; Klaus Mainzer (2009) offers a helpful overview of this trajectory in robotics research. Furthermore, the domain of social robotics exemplifies an attentiveness to embodied practices: Selma Šabanović (2014, 351–53) describes the development of a culturally specific folk dancing application

as part of the Humanoid Robot Group's work in Japan, as well as their inclusion of an anime artist to aid with robotic body design.

The type of AI possible is only one of a number of questions prompted by reflection on the relationship between "intelligence" and the body. Essentially, these questions revolve around what happens to bodies as we pursue the hypothetical scenarios of both the uploading of our own minds (which presumably will not remain restricted to our current "processing" capacities) or the development of general AI. We might ask whether "artificial" intelligence is aimed at simulating *human* intelligence. Although human intelligence has tended to be the starting template in AI research, notions of general AI have acknowledged a plurality to the concept of intelligence. How might nonembodied intelligence depart from our present embodied experience? This is mainly speculation at this stage, and depends upon subjective evaluations of different forms of intelligence. We do need to consider what we might lose if we move further away from our present bodily relation to the world outside of us, what happens to our intuitive ability, our shared language and understanding, and so on. But on the flip side, new ways of occupying the physical world may enrich our metaphorical understanding and thought processes in unforeseen ways.

Can there be adequate communication between embodied and nonembodied intelligence? This question immediately throws us into the swampy territory of strong versus weak AI, the validity of the Turing test, the Chinese room argument, and so on. A lot of these debates in AI research and the cognitive sciences, however, are focused on whether a computer can either simulate or possess a human mind. The argument here, though, is that whatever kind of mind a computer might lay claim to, it cannot really be a *human* mind, because human minds come in human bodies. Of course, *human* minds and bodies (as we presently conceive them) are inherently finite; transhumanists are not unique in their anticipation of bodily transformation and radically new bodies have long been a feature of religious apocalyptic texts (e.g., 4 Ezra, 1 Corinthians).

With the various proposals for mind uploading and AI, we are interested in whether minds enmeshed in biological systems and bodies can find a common way of communicating and understanding with minds embedded in other material, or even disembodied, given they inhabit the same world in very different physical configurations. All the subtleties of human-to-human communication, many of which operate at intuitive and instinctive levels, are at the very least complicated by an increase in alternative morphologies or nonphysical existence. It is a much bigger communication gap than those presently in place due to language or cultural barriers.[10] The growing ability of present AI technology to understand human communication is still dependent on embodied knowledge, albeit secondhand. Machines learn from human-produced data and interpretation to "understand" both verbal and nonverbal language. Social roboticists

are recognizing the centrality of embodied communication in ongoing research, as shown in recent investigations of robot-to-robot communications and the effect on human bystanders (Fraune and Šabanović 2014).

Worshipping with/as Disembodied Beings

An emphasis on embodiment extends beyond an abstract picture of cognition, or the practicalities of communication, to other aspects of our human experience, such as religious belief. Theologians and philosophers are attending more to the role of bodily practices, such as the movements associated with particular liturgies, in shaping the way we think and feel about matters of faith (Wynn 2009; Tan 2016). This approach may be located within a broader emphasis on the importance of material culture—Matthew Day summarizes the connection with religion in his claim that "rather than thin cultural wrap arounds that decorate the *real* cognitive processes going on underneath, these elements [of material culture] could represent central components of the relevant machinery of religious thought" (2004, 101, emphasis original).

When it comes to embodiment and religion, we might extend the earlier discussion of metaphor to the related category of narrative. James K. A. Smith highlights the affective and embodied dimensions of our nature as they are bound up in our moral and spiritual formation. "A particular vision of the good life becomes embedded in our dispositions or 'adaptive unconscious' by being *pictured* in concrete, alluring ways that attract us as a noncognitive level. . . . Such pictures appeal to our adaptive unconscious because they traffic in the stuff of embodiment and affectivity. Stories seep into us—and stay there and haunt us—more than a report on the facts" (2009, 58, emphasis original). Liturgies, according to Smith, inculcate in us particular visions of the good life precisely because they are *story*-laden practices, which over time "conscript us into the story they 'tell' by showing" (2013, 109, emphasis original). He goes on to argue that "the formative power of liturgies (whether secular or sacred) is bound up with their aesthetic force. Such liturgies are pedagogies of desire that shape our love because they *picture* the good life for us in ways that resonate with our imaginative nature. Over time, we are formed as a people who desire a certain *telos* because we have been immersed in liturgies that have captured our imagination by aesthetic means" (Smith 2013, 137, emphasis original).

Alasdair MacIntyre identifies humans as "storytelling animals," contending that "I can only answer the question 'What am I to do?' if I can answer the prior question 'Of what story or stories do I find myself a part?'" ([1981] 1984, 216). Our ability to reason morally is developed within the context of our social relationships and early dependencies on others (MacIntyre 1999, 81–83). We understand through story, and narratives depend on embodied cognition.[11] The fundamental quality of storytelling

and story comprehension as a human trait is driven home when we consider how poorly artificial intelligence has been able to "understand" narratives thus far.[12] Processing facts is very different to comprehending stories, a distinction that robotics researchers are now recognizing and allowing to drive their development of embodied robots (Mealier et al. 2017). Uploading minds to radically different bodies, or to a disembodied existence, is therefore likely to impact our ability to comprehend narratives, and thus our capacity to make sense of our world more broadly. Because narratives are inscribed in our liturgical and faith practices, these scenarios will also alter our approach to worship.

This is not to say that uploading human minds or developing a general AI is prohibited by a theological understanding of what it means to be human, or that a proper theological anthropology will necessarily exclude these alternative beings from its understanding of what constitutes humanity. Karen O'Donnell (2018, 2), drawing on performative accounts of the *imago Dei*, argues that AI may well have the capacity to learn to image God. This is a good example of the way in which theological enquiry needs to engage with and respond to emerging technologies and their implications for human being. Often the theological discourse on transhumanism has focused on what a theological perspective can offer—usually a critique, or at the very least a caution. These are necessary contributions, yet the dialogical relationship between science and religion surely means that the former can instruct the latter as well. In the case of transhumanist mind-uploading scenarios, the research and reflection on the nature of embodiment and its relationship to present human cognition should encourage theologians to undertake similar reflections in the context of their own field. Embodied cognition is as relevant for the work of theology as it is for the development of robotics, and the future of embodiment requires input from a broad range of disciplines.

Acknowledging that mind-uploading scenarios and various religious eschatologies share an apocalyptic anticipation of radically transformed embodiment provides us with a different starting point for a theological engagement with transhumanist visions of future "human" existence. While an entirely virtual existence represents a radical departure from our present reality, so too does the immortal, imperishable resurrection body that Paul describes in 1 Corinthians 15. If technological progress results in the kind of disembodied (or differently embodied) intelligence envisioned by transhumanists presently, theologians ought to attend to the way in which worship and even faith itself is impacted by such changes, rather than protest them as incompatible with religious apocalypticism. When it comes to critique, there are plenty of resources within the arena of technological innovation for questioning the transhumanist disdain for the body evident in some of its more extreme proposals already, and theology may find much to commend in the research agendas of social and embodied robotics

in the effort to articulate a more sufficient understanding of human cognition.

Going beyond the more clearly embodied practice of worship, the more intellectual dimensions of religion will be impacted by changes in embodiment. The construction of doctrine (the "theologizing") involves cognition, and is thus unavoidably (for the time being) embodied. The physicality of metaphors in our language applies to our conceptualizing also, albeit in complicated ways that are not completely explored here. It is very possible that uploaded minds or disembodied AI will develop their own metaphors that do not depend on a shared bodily inhabitation of the world in the same way; but this will pose a challenge (or more positively, an opportunity) for theologians. If the task of theology is to find new understanding and expression of timeless truths in every new age, then theologians ought to be at the leading edge of new experiences of embodiment and cognition.

In summary, bodies matter. They are fundamental to the way we make sense of the world in our present experience, and provide much of the scaffolding for a shared understanding and experience that makes meaningful communication with our fellow human beings possible. Religious belief cannot be disentangled from our bodily experiences. Of course, we are also creative, ingenious, and adaptive beings, and can surely develop new ways of knowing, believing, communicating, and worshipping as embodiment changes, but these are questions we ought to be thinking about when we contemplate possible technological futures, both AI and human.

Notes

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1. https://www.vogue.com/fashion-shows/fall-2018-ready-to-wear/gucci
2. *Vogue* would have done better to faithfully reproduce designer Michele's designation "posthuman." For a helpful articulation of the difference between posthumanism and transhumanism, see Scott (2011).
3. Of course, not all transhumanists disdain the body; transhumanist and artist Natasha Vita-More, for example, gives the body prominence in her depictions (e.g., *Primo Posthuman*, 1997) of transhuman existence (note that Vita-More adopts both transhuman and posthuman terminology).
4. Robert Geraci (2010) offers a comprehensive analysis of the common emphasis (as well as the divergences) on the apocalyptic within religious and technological visions of the future.
5. See for example Merkle 1993.
6. Susan Hurley (1998) gives an accessible introduction to the neuroscientific evidence against traditional understandings of cognition.
7. The notion of continuing sensory input via some kind of post-upload body was already proposed by Moravec, although Moravec envisions this as a temporary accommodation—over time the uploaded mind will transition and adapt to an increasingly virtual, disembodied state.

8. The alliance between AI researchers is *perceived* as stronger than is actually the case—although AI innovation is a central part of transhumanist visions of the future, many AI researchers would be quick to distance themselves from transhumanist philosophy.

9. A helpful analysis of the Cog and Kismet project is offered by Anne Foerst (1998).

10. Of course, we do not share one common bodily experience even now. Studies in gender or disability already challenge us to consider how different bodies shape different perspectives and produce different realities. They can expose the ways in which particular types of bodies are treated as normative, as well as the dominant representation of technological "cure." The way in which ideal "types" of the humans are encoded in the technologies we develop must be examined critically (Midson 2018, 193). We still have a lot to learn when it comes to present embodiment, but these discourses at the margins offer a more concrete engagement with varied embodiment than the abstraction of much of cognitive science and AI research.

11. An example of this connection is demonstrated in Marco Caracciolo's (2012) "enactivist" paradigm.

12. Recent work in computational algorithms to interpret emotional arcs in stories has the potential to improve the ability of AI to comprehend stories (e.g., Reagan et al. 2016; Chu and Roy 2017).

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