Artificial Intelligence and Online Spirituality

with Mohammad Yaqub Chaudhary, "Augmented Reality, Artificial Intelligence, and the Re-Enchantment of the World"; and William Young, "Reverend Robot: Automation and Clergy."

AUGMENTED REALITY, ARTIFICIAL INTELLIGENCE, AND THE RE-ENCHANTMENT OF THE WORLD

by Mohammad Yaqub Chaudhary

Abstract. There has recently been a surge of development in augmented reality (AR) technologies that has led to an ecosystem of hardware and software for AR, including tools for artists and designers to accelerate the design of AR content and experiences without requiring complex programming. AR is viewed as a key "disruptive technology" and future display technologies (such as digital eyewear) will provide seamless continuity between reality and the digitally augmented. This article will argue that the technologization of human perception and experience of reality, coupled with the development of artificial intelligence (AI)–based natural language assistants, may lead to a secular re-enchantment of the world, in the sense outlined by Charles Taylor, where human existence is shaped through AR inhabited by advanced personal and social AI agents in the form of digital avatars and daemons, and that enchantment has been persistent throughout the formation of modernity and is being rekindled by the integration of AI in the plane of AR.

Keywords: artificial intelligence; augmented reality; cyberspace; enchantment; intelligent virtual assistants; natural language processing; philosophy; Charles Taylor; theology; virtual reality

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Or let my lamp, at midnight hour,
Be seen in some high lonely tower,
Where I may oft out-watch the Bear
With thrice-great Hermes, or unsphere
The spirit of Plato, to unfold
What worlds or what vast regions hold
The immortal mind, that hath forsook
Her mansion in this fleshly nook:
And of those daemons that are found

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In fire, air, flood, or underground,
Whose power hath a true consent
With planet, or with element.

– John Milton, "Il Penseroso," 85–96

Augmented Reality and Virtual Reality

There have been numerous waves of research and development in augmented reality (AR) and virtual reality (VR) over the past five decades with the aim of producing viable consumer technologies, similar to those that have often been depicted in science fiction visions of the future. In the past few years, VR technology has undergone steady maturation and adoption beyond a range of existing niche applications, such as training simulations in medical and military contexts, which are already in active use. In view of this progress in VR, AR has also received significant fresh attention for development, this time building on the well-established technological foundations provided by the ubiquity of smartphones with high-resolution displays, cameras, and a complement of sensors. Hence, in the past year, there has been a significant impetus from major technology companies to integrate high-quality AR into real-world scenarios with the ambition of becoming the dominant AR platform in the future, especially in anticipation of new display technologies (such as digital eyewear) that will provide seamless continuity between reality and digitally augmented features.

The term VR, as it is currently understood to refer to computer-generated simulated environments, was first popularized by Jaron Lanier in the early 1990s (Lanier 2017), and a significant source of the inspiration that has shaped the nature of contemporary VR was illustrated in the 1992 science fiction novel *Snow Crash*. The author, Neal Stephenson, became chief futurist at Magic Leap in 2014, which is currently one of the most well-funded companies developing an AR platform, and the novel has been cited by Michael Abrash, who joined Oculus VR as chief scientist in 2014, as a major inspiration.

A key moment in the history of VR was Ivan Sutherland's demonstration of the first head-mounted display (HMD) in 1968, now considered the first example of VR technology (Sutherland 1968). The significance of this technological demonstration in founding the field of VR was recently attested to in a special panel at SIGGRAPH 2018 to commemorate the fiftieth anniversary of VR. Sutherland's HMD, named "The Sword of Damocles" because of the elaborate design of the apparatus, which was mounted to the ceiling and hanging above the user, has been considered an early demonstration of AR because it did not fully obscure the user's vision of the real world (Billinghurst et al. 2014, 615; Steinicke 2016, 27).

However, AR, in the contemporary sense, was first demonstrated much later and coinage of the term has been traced to Thomas Caudell in the early

1990s, for a HMD system that provided an augmented view of internal aircraft wiring (Caudell and Mizell 1992; Henderson and Feiner 2007, 6).

The three key features of AR, as proposed by Ronald Azuma, are the combination of the real and virtual, real-time interactivity, and three-dimensional integration and rendering (Azuma 1997). AR has also been described as "mixed reality" (MR) on the basis of its mixing of real and virtual features, where the degree of mixing may be defined along Paul Milgram's reality–virtuality continuum. In this continuum, the fully real and the fully virtual are at polar ends, and the intermediate region pertains to MR that spans cases where reality is the basis for augmentation by virtual features (AR) and cases where virtuality is the basis for augmentation by real features (augmented virtuality) (Milgram et al. 1995).

There have been numerous waves of interest and development in virtual and augmented reality (henceforth V/AR) over the past four decades, yet the technology has never proliferated beyond niche applications. A major turning point in the viability of VR for widespread adoption came after the $2 billion acquisition of Oculus VR technology by Facebook in 2015, which was swiftly followed by a range of competing headset technologies such as the Steam/HTC Vive VR and Sony PlayStation VR headsets. In addition, it was realized that hundreds of millions of modern smartphones, with high-resolution displays and advanced sensors, could be adapted to act as displays in relatively inexpensive headsets, leading to the integration of Oculus technology in Samsung's Gear VR system and Google's development of the Daydream VR platform for Android phones.

The first mobile AR system was demonstrated just over two decades ago by the Columbia University's Graphics and User Interface Lab, which involved a large backpack to carry the electronics and a head-worn display, making it impractical for any use outside of a research lab (Feiner et al. 1997). However, in the past year, the ubiquity of smartphone technology has been instrumental in the recent surge of development in AR technologies, which now comprises a mature ecosystem of hardware in the form of over a billion devices already in consumer hands, software platforms to run AR content, and developer toolkits to accelerate the design and deployment of AR applications.

Attempting to reach this stage has been a persistent goal for technology firms and follows only a few years after Google demonstrated Google Glass in 2012 based on their Project Tango platform, which is now being deployed for their latest AR development platform known as ARCore. This new platform is already on its second major version and preinstalled on over 100 million devices. Similarly, Apple released the second version of its own platform known as ARKit, earlier in 2018. AR is thus regarded as a key "disruptive technology" that will be available on billions of devices and will generate revenues in excess of $160 billion by 2021 (IDC 2017).

A wide range of acronyms and terms are now being used to attempt to account for all the existing and possible forms of "reality" technologies. An earlier conceptualization of MR involved the idea of a computer-mediated reality, which adds a second axis to Milgram's reality-virtuality continuum for the addition or subtraction of perceptible entities from the reconstituted reality. Computer-mediated reality may therefore be considered a superset that encompasses MR, AR, and VR (Mann et al. 2018). Another acronym for these technologies that is gaining acceptance is XR to refer to the concept of "extended reality." While it is not our purpose to provide a catalogue of terms for reality technologies, this brief overview illustrates the scope of interest in the technologization of human perception and experience of reality, and hence its commercialization, which is set against the backdrop of recent theories about reality emerging from the intersection of AI, cognitive science, neuroscience, and psychology, where reality as perceived by humans is considered an illusory construct of the brain (Frith 2007, 111).

The ultimate conceptual target for VR, discussed in a recent article about why VR is of interest to philosophers, has been described as the reconstruction of the model of reality experienced in consciousness, such that a "perfect" VR system would lead to the creation of a "synthetic phenomenology" (Metzinger 2018, 3–4).

Our purpose in what follows is to show that the confluence of V/AR and AI should also be of interest to theologians, philosophers of religion and science, and sociologists because it presents a contemporary narrative of enchantment that involves a new realm for magical and ritualistic actions, populated by avatars and exteriorized simulations of the self in daemons, and further entails metaphysical considerations from reconceptualizations of space and reality.

Disenchantment and Secular Enchantment

The concept of the disenchantment of the world has been the subject of considerable scholarly discourse over the past century. Throughout this time, philosophers, sociologists, and theologians have tried to understand the nature of this disenchantment, what it meant to be enchanted, and considered the dynamics of re-enchantment, if, that is, the world was ever disenchanted.

This article develops this latter point by advancing the view that first, disenchantment has not been as pervasive as imagined, and second, that the residual flicker of enchantment has been persistent throughout the formation of modernity and is being rekindled by the development and integration of AI in the plane of AR.

According to Michael Saler, in his prehistory of VR that explores the enchantment of literary imagined, imaginary, and virtual worlds, modern

disenchantment enchants and disenchants simultaneously, that is, "Modernity remains enchanted in a disenchanted way" (Saler 2012, 13).

Max Weber proposed disenchantment as an expression of the modern condition that has proceeded from a process of rationalization, where, "One could in principle master everything through calculation. But that means the disenchantment of the world" (Weber 1946; Sherry 2009, 370). An alternative translation of Weber's concept is "losing its magic," that is, a demagicification, with its early origins in religious concerns that delegitimized practices involving spirits and forces as blasphemous magical rituals. Hence, disenchantment meant the loss of a sense of supernatural beings operating in the world. Charles Taylor applied its antonym to describe the premodern condition of the Middle Ages as an enchanted world where people believed in angels, demons, sacraments, relics, and sacred places (Taylor 2007, 25–26). Enchantment in this sense does not necessarily entail belief in God.

According to Taylor, the two features of the world that disenchantment did away with were first, a world filled with spirits (meaning God, angels, demons) that were "indistinguishable from the loci they inhabit" and moral forces from relics that impinged on human beings and, second, disenchantment did away with meaning within the cosmos. In both cases, an enchanted world has causal powers, which are capable of bringing us "into its field of force" (Taylor 2014, 291). Such a world is inhabited with extra-human agencies and minds, which represent "loci of spiritual power" with benevolent or malevolent intent (Taylor 2007, 32). Taylor notes that the presence of either of these features makes atheism untenable, whereas Weber dismissed the return of religion since this would involve a "sacrifice of the intellect" and thus equated disenchantment with the end of religion. However, numerous writers since Weber have argued that the world was never fully disenchanted (Sherry 2009) and the narrative behind the concept of disenchantment itself has been re-examined multiple times.

In Christopher Partridge's two-volume examination of the "re-enchantment of the West" (2004, 2005), he argues that secularization and re-enchantment run together as two aspects of the same process and analyzes numerous movements and groups that constitute a growth of re-enchantment in a secular age. These movements include well-being, psychedelics, and eco-enchantment, and he cites Bronislaw Szerszynski, who argues that "[t]echnology is the desacralization of nature," and who shows that contemporary attitudes to nature and technology have a religious character (Szerszynski 2005, 5).

Occulture is another key aspect of re-enchantment discussed by Partridge, who considers it to be "the new spiritual environment in the West" (Partridge 2004, 4) and "a return to a form of magical culture" (Partridge 2004, 40) with films, literature, and music cyclically drawing from and expanding a reservoir of occult themes. Partridge argues that to explore such

notions "is to re-enchant the world" on the basis that they reinject mysterious aspects into an individual's understanding of the world (Partridge 2004, 169).

A recent work by Jason Josephson-Storm on *The Myth of Disenchantment* (2017) challenges and complicates the narrative of disenchantment in standard accounts of secularization and modernization by tracking the persistence of magic and the occult throughout society, as well as in the cultural and intellectual history of numerous disciplines. Josephson-Storm details several striking convolutions of enchantment and disenchantment in the works and thought of social scientists, philosophers, and scientists. He therefore argues against a binary opposition between enchantment and disenchantment to present a complex entanglement whereby "supernatural beliefs can actively function in the service of disenchantment" (Josephson-Storm 2017, 18, 29). In a slightly earlier work, Egil Asprem follows a very similar line of enquiry to show how eminent figures throughout the sciences and philosophy were immersed in occultism, contrary to the received view that "The modern academy and especially the natural sciences were supposed to have been the very engine of the disenchantment process" (Asprem 2013, 2).

According to Josephson-Storm, modernity constitutes a false paradigm and the "myth of disenchantment" has functioned as a "regulative ideal" to be modulated toward the suppression or revitalization of belief in spirits, magic, and occulture, to serve the dictates of power and ideology. Most significantly, he provides a revised characterization of Weber's understanding of disenchantment based on newly available sources which reveal Weber's own foray into mysticism, and suggests an alternative reading of "the disenchantment of the world" which grants the persistence of magic into modernity rather than placing magic and rationality in opposition. Hence, this work lends support to key themes in the discussion that follows on how technology is intertwined with and perpetuates enchantment, and on the continuity of enchantment from religion to science.

A similar entanglement persists in academic communities today in the remaining two forms of re-enchantment discussed by Partridge, namely, apocalypticism and extra-terrestrials. Interest in both of these is often found to coincide among researchers considering the future of humanity and issues of existential risk (Noble 1999; Future of Humanity Institute [FHI] 2013; Sandberg et al. 2017).

An additional form of contemporary technological enchantment, not specified in Partridge's survey, is transhumanism, which exhibits a similar interpenetration of enchanted and disenchanted modes of thought discussed by Josephson-Storm. According to Hava Tirosh-Samuelson, transhuman discourse, in its pursuit of a future posthuman age, may be viewed as a secular faith that "hybridizes the religious with the secular, in effect 're-enchanting' the secular while simultaneously aligning with

Enlightenment rationality over religious belief" (Tirosh-Samuelson 2012, 731).

Tirosh-Samuelson distinguishes between philosophical–cultural posthumanism and technoscientific posthumanism, which enclose two divergent strands of transhumanism, one focused on enhancement in the present, the other on cyber-immortality in the future. She thus characterizes technoscientific posthumanism as a vision that adopts religious motifs in its aspiration to "endow technology with salvific power" and the latter form of futurist transhumanism as a process "saturated with religious themes," with an apocalyptic mentality and eschatological narrative that drive the process toward a transcendent posthuman future. It is this assignment of salvific meaning to technology that entails a secular re-enchantment in the case of posthumanism and transhumanism.

The conceptualization of transhumanism as a secular religion has also been expressed by several others; in particular, Robert Geraci directly connects the "enchantment of cyberspace" to the rise of transhumanism as a new religious movement (Geraci 2010, 13). With this connection between cyberspace and transhumanism, we finally turn toward the most relevant of the enchantments discussed in Partridge's survey, namely, cyberspace as a plane of enchantment and transcendence in a secular age.

Cyberspace

William Gibson described cyberspace as "a consensual hallucination experienced daily by billions of legitimate operators" (Gibson 1984, chap. 3), which we may compare to contemporary neuroscience, where human perception is increasingly viewed as a "controlled hallucination" as described by Anil Seth (Seth 2017). Similarly, the neuroscientist Christopher Frith said over a decade ago that the brain creates our mental world and that "[y]ou could say that our perceptions are fantasies that coincide with reality" (Frith 2007, 135).

Before proceeding, we note that the term "cyberspace" stems from "cybernetics," which was deployed by Norbert Wiener for his concept of a science of control and feedback systems. Cybernetics shares its derivation with the word "governor," from the Greek *kubernetes* meaning "steersman" (Wiener 1965, 11; Wiener 1989, 15); hence, cyberspace conveys the meaning of being a controlled or governed space. This provides an important contextualization for understanding the value to be created for commercial organizations by investing vast sums in developing cyberspace technologies, and it has previously been argued that the function of cyberspace is to create "a globally predictable consumer culture" (Cubitt 1996, 246). However, here, we emphasize the theological and philosophical implications of future developments of cyberspace.

The elimination of a sacred realm from the modern Western worldview has led to cyberspace being conceived of as a new "sacred space" that restores a dualistic conception of reality, which is thus newly constituted of a "material realm described by science, and an immaterial realm that operates as a different plane of the real" (Wertheim 1999, 229). In this connection, Nicole Stenger discusses the potential for cyberspace to unseal a new area of reality, which provides the conditions for Mircea Eliade's "hierophany: an irruption of the sacred" (Eliade 1959, 26; Stenger 1991, 55).

As Partridge discusses, this conceptualization of cyberspace as a new realm makes it an environment conducive to occulture and magic, which was promptly noticed by early writers on cyberspace such as Marcos Novak, who described it as "a habitat for the imagination" and "a landscape of rational magic, of mystical reason" (Novak 1991, 226).

Following this, Stef Aupers countered the assumption that magic and technology are mutually exclusive by focusing on a group of computing specialists in the 1990s in Silicon Valley who identified themselves as "technopagans." Aupers's study showed that many members of this group believed in an affinity between technology and magic. For nonspecialists, the opacity of technology "generates new magical discourses" about it (Houtman and Aupers 2010, 21). Hence, according to Aupers, even at an early stage the digital environment was conceived of as being populated by a range of autonomous entities with their own type of "life" such as AI, viruses, and bots, and he concludes that this is a form of enchantment best understood by anthropological theories of animism and magic (Aupers 2002, 206; 2010, 21).

According to Aupers, a minimal definition of animism combines three features: first, attributing subjective characteristics to the material environment; second, assumptions that objects actively and autonomously influence human life; and finally, accompanying feelings of fear, fascination, and awe with respect to these objects and entities (Aupers 2002, 209). Aupers thus characterizes discussions on AI and artificial life among technologists in the early 2000s as imbued with animistic themes, namely, subjectivization, autonomous influence, and awe (Helmreich 2000, 195; Aupers 2002, 202–03), all of which permeate the present discourse on AI.

Elaborating on the connection between alienation and awe, Houtman and Aupers discuss how alienation arises from computer technology by its detachment from human control, which renders it opaque and autonomous. We note that this situation is now fully expressed in contemporary AI discourse, where the focus of the field is increasingly directed toward addressing issues of explainability, interpretability, transparency, and understandability of the processing of data by AI systems based on deep neural networks (Doshi-Velez and Kim 2017). With this contemporary approach to AI, the ambition has become the pursuit of nonmastery

by design, and the success and novelty of new AI algorithms are often determined by the extent outputs surprise or go beyond the expectations of the designers, rather than according to clearly defined specifications (Helmreich 2000, 70; Dupuy 2013, 63–64).

According to Houtman and Aupers, such circumstances yield a sense of alienation, which triggers feelings of awe and stimulates animistic and magical reactions from technical practitioners, and more so among the general public. Hence, seeming rationalization turns from being disenchanting to driving re-enchantment by prompting "magical-mythical imaginations about modern technological systems" (Houtman and Aupers 2010, 23).

Among the group of technopagans referred to earlier was Mark Pesce, who helped develop a "virtual reality modelling language" (VRML) in the 1990s. For Pesce, "both cyberspace and magical space are purely manifest in the imagination" and the language previously used to refer to the astral plane now describes the realm of cyberspace (Davis 2004, 229; Partridge 2005, 138, 142; Asprem and Granholm 2013, 160, 171). Hence, the unlimited potential for the actualization of imaginary worlds in cyberspace has borne comparisons to the concept of magical space.

Wouter Hanegraaff discussed how the category of magic has survived disenchantment and made a computer analogy between notions of magical and digital planes. Digital images on the screen appear real, but reflect an underlying fundamental reality of computer code that is invisible to the user, yet accessed by the programmers. In this analogy, the programmer is like the magician who operates in a supposed parallel reality with its own symbolic language, Hanegraaff thus finds it hardly surprising that many computer enthusiasts are also interested in magic and occulture (Hanegraaff 2003, 370).

In addition to magic and neo-paganism, links between cyberspace and Gnosticism have been explored by Erik Davis and others. In brief, what unifies different manifestations of Gnosticism is a dualistic ontology comprised of two realms of being, such as spirit and matter, soul and body, good and evil (Jonas 1952; Jonas 2001, 31; Vondung 2000, 372) with "one evil and alienating and the other offering salvation" (Aupers, Houtman, and Pels 2008, 690). Davis coined the term "techgnosis" to imply a secularized version of Gnosticism in which pure intelligence and information replace spirituality, thus offering transcendence from embodiment in flesh (Davis 2004).

Aupers et al. have used the term "cybergnosis" to describe this strand of fusion between religion and technology, which represents "a relocation of the sacred to the digital realm." However, it is important to note that they do not conceive of modern gnosis as a straightforward combination of religion and science. Instead, they suggest it is a phenomenon best viewed as a discursive practice that disturbs classical theories of secularization, and

that cybergnosis "confuses the dichotomy between religion and science," which thus allows past religious ideas to continue into the future, outside of religious contexts (Aupers and Houtman 2005, 3; Aupers, Houtman, and Pels 2008, 693).

In *TechGnosis*, Davis mentions that the powerful aura of digital technologies is not only from novelty or complexity, but also from the fact these technologies are the "literal realization of the virtual projects willed by the wizards and alchemists of an earlier age" (Davis 2004, 48). The technological world may thus be conceived of as an augmented supernatural realm or, more suitably, a preternatural[1] digital environment.

Populating this realm is a range of informational entities, either machine or humans through the digitalization of human ontology, whereby spirit is represented by information, which has come to be viewed as constituting the essence of the universe (Graham 2002, 73; Davies and Gregersen 2014), and thus provides ontological contiguity between the virtual world of cyberspace and the real world, permitting a migration of the digitalized "spirit" to a world of total informational representation. This conception of spiritual migration into cyberspace has been linked to Gnostic conceptions of a transcendent reality that holds enchanting, magical prospects, filled with wisdom, spirits, and magical patterns.

Aupers and Houtman conclude that cyberspace combines inspirations from magic and neo-paganism, on the one hand, and liberation of the digitalized self, based on Gnostic beliefs, on the other, to show how religion, spirituality, and technology converge to form a new discursive phenomenon in contradiction to theories of secularization and disenchantment. It is VR technology that provides the most encompassing immersion into the ethereal realm of cyberspace possible at present through the integration of audio, visual, tactile, and motile modalities, which "offers limitless subjective experiences and possibilities of re-enchantment" (Aupers, Houtman, and Pels 2008, 697).

Virtual Reality

In a recent work, Lanier revisited his own role in the history of VR as the founder of the first commercial VR company. Throughout the text, Lanier provides over fifty definitions or perspectives for how VR may be understood, such as VR as an art form, a simulation, a medium for dreaming, in the context of gadgets and devices, a brain-related technology, a perfect skinner box, a box of magical tricks, a medium for entertainment, a cybernetic construction, and so on (Lanier 2017). Michael Heim, philosopher of VR, has used the terms "immersion," "interaction," and "information intensity" as keys to the definition of VR (Heim 2000, 7), and VR has been described as "the science of integrating man with information" (Warwick et al. 1993; Woolgar 2002, 42).

In the process of this integration, VR and pure reality overlap and merge, leading to the situation described by Jean Baudrillard where "reality slips out of focus" such that the former replaces the latter (Baudrillard 1994). The distinction becomes so eroded that an ontological distinction is no longer conceivable and the whole of reality is replaced by simulation, which becomes more real than real, or "hyper-real" (Partridge 2005, 143). Hyper-reality may be further defined to include the seamless integration of VR, physical reality, artificial intelligence (AI), and human intelligence (HI) (Tiffin and Terashima 2001, 4).

According to Barbara Becker, what attracts people to communicating through technology with virtual selves is the desire to overcome the barriers of physicality and avoid the concrete resistance of materiality (Becker 2000, 364–65). On this view, VR "provides a sense of relative gain in mastery" (Lilley 2013, 32), and this is being significantly enhanced by numerous technological developments in the field of VR.

In particular, there has been sustained progress in areas such as focus tracking, field of view, incremental improvements to resolution and image quality, and eye tracking, all of which significantly improve the foundations for VR designers to bring to realization more convincing illusions of being present in completely different environments from the physical location of the body.

With the present resurgence of VR, more attention has been drawn to its psychological and sociological implications, building on a history of experiments related to self and bodily perception such as the rubber hand illusion where participants gradually gain a sense of ownership of a rubber hand placed in front of them by tactile stimulation of the rubber hand and their real hand, while their real hand is occluded from view (Ehrsson et al. 2004). Another earlier study describes the "Proteus Effect," where people alter their behavior to conform to their virtual self-representation in different avatars with varying degrees of attractiveness, after seeing their avatar through a virtual mirror (Yee and Bailenson 2007).

A more recent study investigated how a sense of ownership extends to use of novel avatar bodies, with a variety of body plans in VR, where the authors posit that the part of the cortex that maps movement and sensing of body parts is capable of adapting to novel bodies, a phenomenon the authors describe as "homuncular flexibility" (Won et al. 2015). In addition, it has recently been shown that VR appears to induce illusory ownership of an invisible body only from the appearance of gloves and socks seen through a VR headset, which move in synchronicity with the user (Kondo et al. 2018).

Finally, recent studies have attempted to investigate the type of reality experienced in VR. One such study examined the effects of VR on human psychology, where the authors suggest that VR creates a new category of immersion, which cannot be relegated to being described as a second-order

reality because of its capacity to override human perception, despite the limitations of current systems in areas such as visual resolution and field of view (Schöne et al. 2017).

Augmented Reality

AR is the intermediate realm between the totalizing experience of VR and the concrete world. Another way to understand the difference between the ambitions of VR and AR is that the former seeks the disappearance of the screen itself by placing the viewer in a new virtual space, whereas, the ambition for AR is the convergence of virtual and real space to achieve greater degrees of perceptual continuity between the virtual and real (Avram 2016, 35). The 2016 Pokémon phenomenon, which brought imaginary creatures into the physical environment, represented an early glimpse of the transformative power of AR technology.

Now, AR has reached a state of significant technological maturity and has been a core theme at the most recent technology developer conferences in 2018. Major technology firms, such as Facebook (and its VR subsidiary Oculus), Samsung, Google, Microsoft, and Apple all demonstrated AR user experiences alongside toolkits and frameworks to facilitate AR development and creative design. Speaking earlier this year, Matthew Simari, product manager of Facebook Camera, summarized the ambition by saying that "In the future, we believe AR will be in the world all around us. Rather than the ephemeral 'capture and share' sessions we see today, AR will sit in a hidden data layer that you access through your devices–phones today, glasses tomorrow" (Constine 2018).

Early examples of AR based on the latest AR development kits include retail, business, social media, education, and healthcare applications, which Simari describes as the first instantiation of the above vision, where the phone is "the magnifying glass that is allowing you to peer past your reality into a hidden experience locked to a place or object in the world around you" (Constine 2018).

V/AR processing cores are already built into the hardware of the current generation of smartphones, coupled with numerous other sensors such as gyroscopes, accelerometers, and cameras, and AR is being driven forward by technical success in areas such as persistence, occlusion, lighting, tracking, anchoring, and context awareness. The key feature of the latest AR technology is that augmentations can be made to go beyond mere digital overlays that are transitory and ephemeral to being seamlessly blended, stable, and persistent within dynamic physical environments. With AR, the environment can be populated by "ARtifacts" that sit at the conjunction of the material and immaterial.

The software backends, programming interfaces, and design tools are now at an advanced stage, especially with respect to facilitating the design

of AR content by making the tools accessible to communities of artists and designers without requiring complex programming. Concerted efforts are being made by technology firms to become the dominant platform for AR. For example, Facebook has described this as the beginning of a ten-year vision for AR, which will lead to the creation of a new computing paradigm where physical and digital objects are blended to the extent they become indistinguishable (Slater 2018). Similarly, besides developing its own platform for AR development, Apple has made a series of acquisitions that relate to core AR technologies, such as its recent acquisition of a start-up specializing in waveguide-based lenses for AR displays (Reuters 2018), which reveals a strong intent to create digital eyewear as a new category of device beyond smartphones.

Artificial Intelligence and Augmented Reality

Coupled with this development in AR is the development, and widespread adoption, of AI-based natural language assistants in a variety of forms such as simple chatbots and more advanced intelligent virtual assistants, which provide "conversational interfaces." It is worth noting that improvements in AI techniques have been vital in addressing several challenges in AR technology, especially in areas of machine vision and object recognition, which are required to map the physical environment ahead of applying augmented features. Thus, AI is instrumental in the realization and establishment of a digital plane of reality at multiple levels. Our focus in this section is the role of AI as a counterpart or augmentation to the human intellect.

AI technologies have been deeply embedded at the hardware and software levels in modern smartphones and operating systems. An example of this integration is the unavoidable placement of the Bixby AI button in Samsung phones, which lies directly beneath the resting position of the left thumb when holding the phone. Whether this is intended to facilitate user experience or designed to funnel user activity toward interaction with AI-based applications, which depend on the oxygen of data, is a matter of contention to be addressed elsewhere. However, there appears to be an unassailable effort by major technology firms to steer users toward interaction with AI. For example, Microsoft's AI assistant, Cortana, is baked in to the Windows 10 operating system as a permanent background service. Similarly, Google Assistant and Apple's Siri are integrated at a system level in smartphones, and Amazon's Alexa voice platform will soon be integrated into a wide range of other devices to turn them into Amazon echo devices as well.

A recent AI voice assistant demonstration that warrants mention in particular was Google's first public demonstration of their AI assistant, named Duplex, at their May 2018 conference, which is able to perform real-world

tasks such as make appointments over the phone through natural dialogue with a human operator at the other end of the call. The seemingly natural speech of the voice assistant is generated using deep learning techniques developed by the Alphabet subsidiary, DeepMind, and is capable of emulating characteristic stutters and vocalizations of human speech, as well as managing unconventional responses from humans receiving the call. Another demonstration of interest for its implications for human–computer interaction, especially in relation to children's interactions, was titled "Pretty Please," which is a feature requiring requests to Google's AI assistant be phrased politely with "Please" at the end.

In addition, there was a brief overview of new AR features for smartphone navigation in the Google Maps application whereby the phone display provides an augmented overlay for directions and detailed information cards attached to buildings and sights. This demonstration concluded with a glimpse of a digital representation of a fox to act as a guide for the user to follow, evoking the daemons in the enchanted world of Philip Pullman's novels, which are manifestations of a person's soul in animal form, with HI and capable of speech.

The word *daemon* comes from the classical Greek for spirit and is used to refer to any malevolent or benevolent spirit, hero, or ancestor spirit that mediated between transcendent and temporal realms. It later came to be understood to apply to evil spirits, who frustrate, harm, and tempt humans to sin (Partridge and Christianson 2014, 1).

The proliferation of intelligent assistants and their increasing sophistication has been anticipated for decades such that their presence in the firmament of cyberspace has been a prosaic feature in the writings of numerous popular science fiction visionaries such as Michio Kaku, who said in 1998 (which coincides with the previous wave of interest in V/AR), that in the future "We will speak to our appliances, and they will speak back" (Kaku 1998, 14). Similarly, AI assistants have been a basic trope in science fiction narratives in literature, films, and video games. A few recent examples include the 2013 film *Her*, which is often cited for its exploration of human companionship with a disembodied artificial general intelligence (despite the science fiction embellishments of the story) and the 2017 films, *Marjorie Prime* and *Blade Runner 2049,* which included embodied AI companions that effectively appear in AR by holographic projection.

Technical interest in intelligent virtual agents that use "natural language processing" (NLP) has been contemporaneous with work to develop V/AR, where it represents an obvious interface for hands-free control, data input, and feedback. A key frontier for research in voice-based agents is emotion detection and generation, which is central to the field of "affective computing" (Picard 1995, 2000). What is significant, at the time of writing, is that through progress in far field speech recognition on one hand, and AI-based NLP on the other, we have now arrived at a stage where these

agents and entities are capable of processing and approximating the most complex human behavior, namely, intelligible speech.

What is yet more significant is the surprising rate of acceptance and adoption of this technology, despite the limitations imposed by its technical foundations on weak or narrow AI and machine leaning systems. It has recently been estimated that two million children in the United Kingdom are interacting with smart speakers, and the most common uses, from surveys in the United Kingdom and the United States, include listening to music, requesting weather forecasts, listening to jokes, searching for information, and seeking help with homework (Watkins 2018; Adobe 2018).

A broad discourse on the social, ethical, and moral implications of voice assistants is now taking place outside of the academic literature (Elgan 2018; Gonzalez 2018; Shulevitz 2018). Earlier research has addressed human–robot interactions, most prominently by Sherry Turkle and collaborators, who described sociable robots as "relational artifacts" which present themselves as having "states of mind" (Turkle et al. 2006); hence, such entities introduce complications about the development of a "theory of mind" during childhood (Turkle et al. 2006; Marchetti et al. 2018) and children's ability to distinguish between living and nonliving things (Opfer and Siegler 2004; Turkle 2005). Emerging research on children's interactions with the latest voice-based assistants has found the counterintuitive result that children from 6–10 years old considered the assistants to be "more intelligent than they are even if these devices could not always answer their questions" (Druga et al. 2017; Druga et al. 2018, 231). Further elaboration of these issues is unfortunately beyond the scope of this article, despite their considerable implications.

We may further substantiate our claim that the intersection of AI and AR technologies foreshadows the emergence of entities that are directly analogous to daemons by considering the background and foreground discourse that accompanies technological development of AI chatbots and virtual assistants. Given the rapid pace of development and increasing speed of deployment of digital technology, we refer directly to talks delivered at the most recent technology conferences at the time of writing, many of which may be viewed online.

At the 2018 CognitionX conference in early June, attended by the author, the development of chatbots was a major theme throughout the two days, besides discussion on smart cities, autonomous vehicles, and a host of other AI applications. In a brief remark during a panel session, Dame Wendy Hall said that "We are building our own daemons" (CogX 2018). A second, and much more decisive evocation of daemons, was pronounced on the Cutting Edge Stage in a presentation titled "Centaurs or Butlers? Designing for Human Relationships with Non-Human Intelligences" by Matt Jones, principal designer at Google AI, where he expressed the deep

influence of Philip Pullman's novels on his work,[2] and explicitly stated that "[w]e are creating daemons" (Jones 2018). It thus comes as no surprise that Jones's personal website is titled "Magical Nihilism," which illustrates that an enchanted imaginary worldview from science fiction continues to be, and has been, part of the social imaginary of computer scientists (Flichy 2014, 698).

To further illustrate the broader ambition for AI assistants and V/AR technologies, we may consider technologies presented at recent conferences of the major companies invested in the development of AI and V/AR systems. In particular, work presented at these conference shows that a key area of development for social networking companies is the avatarization of human presence in V/AR. For example, the Oculus conference in September 2018, available to view online, included numerous examples of progress in avatars and reiterations of their ambition to create lightweight eyewear for AR (OC5 2018). Similarly, Magic Leap outlined their vision for AI and AR at their October 2018 conference by describing the intelligent avatar companion they are developing as "The Spirit."

Digital avatars are three-dimensional representations in a virtual environment that embody actions, gestures, and emotions of a person or autonomous agent. The word *avatar* is from the Sanskrit meaning incarnation, usually of a deity; it literally means the descent of god." Besides providing presence for humans in cyberspace, avatars are a key step toward the transposition of activity from our natural habitat to the artificial habitat of the infosphere described by Luciano Floridi (Floridi 2011, 25).

In summary, these new technologies provide an initial illustration of how V/AR will become the meeting point between HI and future forms of AI. In a recent opinion piece, Andy Clark, a leading proponent of extended cognition, wrote: "It's a world where human intelligence itself is poised for repair and reinvention. And one whose bedrock nature is itself becoming fluid, as digital overlays augment reality with personalized pointers (the information-rich cousins of the contemporary elves and pixies of Pokémon Go). It's also a world permeated by a growing swath of alien intelligences" (Clark 2018).

This brings us back to Taylor's sense of enchantment, which is a world inhabited with extra-human agencies—minds, which are the virtually embodied or disembodied AI daemons referred to in this article, in which benevolent or malevolent intent can reside and represent "loci of spiritual power" (Taylor 2007, 32)—although the form of the spirit stems from a new spiritual dualism between matter and information. Philosopher of VR Michael Heim wrote that "At the computer interface, the spirit migrates from the body to a world of total representation. Information and images float through the Platonic mind without grounding in bodily experience" (Heim 1994, 100). Information is therefore the new spirit, and data, rather

than the "dust" of Pullman's imaginary world, is the ontological substance of the universe in the metaphysical system of postmodernity.

The production of AR media involves sophisticated processes leveraging almost every technology built into a modern smartphone, detailed description of which is beyond the scope of the present discussion; however, the first stage involves the digitalization of the physical scene captured by a digital camera, prior to recomposition with AR features and final audio/visual presentation. Hence, the environment in which AR entities are located is intrinsically a virtualized digital environment, irrespective of the display technology used for presentation. Since the physical environment is not static, successful spatial and temporal integration into the real world requires simulating the underlying physics of the environment to account for dynamic interactions between virtual objects and the environment, temporally and spatially.

The laws of physics in V/AR are effectively a virtual simulation of real-world physics and are therefore unconstrained such that they may be manipulated according to the intent of the designers. Hence, distant spaces can be linked together by portals with instantaneous travel between them (as in the game *Ingress*) and uninspiring doors on small buildings can be portals to vast universes.

The fully enveloping virtual environment of digital VR has been paralleled to a predigital form of virtual environments in architecture such as the interiors of churches or cathedrals that "draw the viewer into a spectacle which transcends the everyday spaces of the temporary world" (Shields 2005, 8). This has been described as the reappearance of the sublime in the twenty-first century through virtual worlds and visions in cyberspace (Hunter and Mosco 2014, 727).

Changing conceptions of space through history and the theological implications of cyberspace were the subject of exploration in Margaret Wertheim's *The Pearly Gates of Cyberspace: A History of Space from Dante to the Internet.* Wertheim describes the computer as a metaphysical gateway into another realm and goes so far as to argue that "the digital domain is an attempt to construct a technological substitute for the Christian space of Heaven," and thus the repacking of the old idea of heaven in a secular, technological form (Wertheim 1999, 18). In this work, Wertheim was writing at a time when cyberspace meant the World Wide Web, where most activity was still text-based, yet she anticipated a time when animated avatars will be used to speak in cyberspace by citing Gibson's characterization of cyberspace as being populated by superhuman AIs with "their own emotions, desires and egomaniacal goals" (Wertheim 1999, 264).

Wertheim focuses much of her discussion on changing conceptions of space from the early medieval period, with the view that the mapping and mastery of physical space of modernity is counterposed with the

nullification of the immaterial space where spirits or souls resided, noting that cultures throughout history have had parallel worlds or multilevel realities. Hence, as a new form of immaterial space entered by the mind, cyberspace amounts to a technological *res cogitans* that leads to the re-emergence of a new dualism.

Wertheim discusses how medieval art may have had an impact on scientific ideas about space and that medieval architecture was the stage for a predigital VR. The gothic imagery of the early medieval period was drawn with no depth or solidity. "Figures floated against nebulous gold backgrounds . . . everything was flat and seemingly two-dimensional" (Wertheim 1999, 79). On the other hand, later medieval art began to depict solid bodies more accurately as occupying physical space. It is thus argued that these artistic movements in linear perspective were tied to reconceptualizations about physical space.

Now, with AR, an entirely new spatial paradigm is becoming possible because of the nature of its interactive, immersive integration of virtual images into real space. The term "augmented space" has been proposed by Lev Manovich to describe a new conceptual model of visuality rather than just a new technology. Hence, as a new visual phenomenon, the notion of "perceptual convergence" has been advanced by Horea Avram, who has proposed that perceptual convergence occurs with increasing degrees of continuity between the virtual and the real (Avram 2013), although eliminating discontinuities is an ongoing technical challenge. The realization of convergence remains a challenge, even in the latest AI platforms; hence, progress toward perfect spatial and temporal continuity is incremental, and the ambition is for it to become a medium that is transparent enough to be a "[l]ooking-glass into the mathematical wonderland constructed in computer memory," which is how Sutherland first described his vision for an "Ultimate Display" before going on to demonstrate the first VR HMD.

Without physical constraints, this Wonderland can thus "be populated with strange denizens such as negative masses, opaque objects that suddenly become transparent, and triangles whose edges become rounded as soon as someone looks at them" (Zabel 2014, 412).

Conclusion

The preceding discussion has argued that we are presently at the inception of a significant revival of interest in V/AR, which is being driven by technological developments in multiple areas and spurred on by commercial competition. It has previously been argued by Robert Geraci that VR and AI will offer "new ways of creating meaning and experiencing transcendence," which will present many new ways of re-enchanting the world through VR (Geraci 2014, 323). In a more recent work, Geraci briefly refers to AR as an example of a technology that leads users to look at

the world with a newly enchanted perspective (Geraci 2018, 5). Here, we anticipate that the use of AR for marketing, educational, workplace, and recreational activities will give rise to a new social phenomenon that may be characterized as a new form of enchantment.

This enchantment will operate at several levels: first, at the level of enchanted discourses and narratives that evoke imaginative virtual worlds filled with curious creatures and conceptions of cyberspace as a realm filled with magical possibilities. The second level of enchantment is subtler, and the degree of enchantment will be proportional to a user's knowledge and understanding of the underlying technology and rationalization of its functionality.

In this situation, users and designers with a strong technical understanding may choose to induce a willful suspension of disenchantment to become momentarily like those with little or no knowledge who are more firmly embraced by its enchanting power, such that their enchantment from AR is similar to the discontinuous enchantment derived from engaging in the imaginary worlds of films, literature, and games. However, in the case of other technologists, an "elective affinity" between digital technology and magic, as discussed by Aupers (2009, 154–55), may already constitute their fundamental worldview.

In the former case, knowledge, familiarity, and experience of virtual worlds may in turn lead to normalization and rationalization that cause enchantment to subside once again. However, a third level of enchantment will counterbalance this normalization. As more of the real world is augmented, more people will come to expect augmented features to be a part of more places and things, which in turn encourages the imagination about what may be discovered and, therefore, may be characterized as a form of enchantment. This may lead more people to gradually transition from the situational affinity between technology and enchantment of the former case to the constant elective affinity of the latter.

A further driver of enchantment is that it is in the interests of companies designing augmented content to continually intensify engagement, that is, outside of professional applications it is desirable for augmented content to be designed with intrinsic properties to captivate attention by exploiting the desire of individuals to be enchanted.

Finally, we have argued that a more pervasive form of enchantment will become operative through AI simulation of the minds of digitally embodied entities in AR. This represents the reintroduction into society of a key feature of an enchanted world, that is, a world believed to be filled with spirits that were "loci of spiritual power" capable of influencing human beings. Now, the external manifestation of the "inner self" in the form of digital daemons and AI agents in cyberspace, made visible through AR, will become the extra-human agencies of a re-enchanted world.

In addition, research in AI makes it possible for the second feature of enchantment, namely, meaning within the cosmos, to become operative once again, by belief in a new cosmic order and chain of being through continuity between machine intelligence and HI (Mazlish 1993; Søraker 2014; Hernández-Orallo 2017; Bhatnagar et al. 2018).

AI and AR thus constitute a significant re-enchantment of a secular age and potentially its most encompassing form.

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Notes

1. Preternatural is preferred over supernatural here since it distinguishes marvels from the genuinely supernatural. On this distinction, Lorraine Daston writes, "Although demons, astral intelligences, and other spirits might manipulate natural causes with superhuman dexterity and thereby work marvels, as mere creatures they could never transcend from the preternatural to the supernatural and work genuine miracles" (Daston 1991, 98).
2. Jones makes a disclaimer that his views do not necessarily represent those of his employer.

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