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Scientific Wonder, Artificial Intelligence, and Awe of the Divine

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Abstract: Science employs wonder and its associated emotions to explore unknown mysteries in the pursuit of knowledge about the natural world. Discovering scientific truth may inspire awe—a transcendent, indescribable experience of enhanced awareness and astonishment at the extensive interconnectedness of reality. The emotion of awe expands human consciousness and also mediates possible spiritual encounters with the Divine. Prompted by wonder and curiosity, scientific studies of the human mind and cognition yield insights that contribute to artificial intelligence research, especially the potential development of conscious artificial general intelligence. Yet, emerging artificial intelligence technologies raise religious and sociological questions about consciousness, personhood, and whether conscious artificial general intelligence is capable of expressing wonder and experiencing awe of the Divine.

Keywords: science; technology; artificial intelligence; religion; spirituality; ethics; wonder; awe; consciousness; divine

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1. Introduction

The relationship between science and religion is a complex combination of collaboration and incredulity. Scientists study and explore various aspects of the natural world; however, some academics express skepticism about religion and its attempts to explain reality. Religious scholars likewise seek understanding about creation, especially in relation to its Divine Creator. Nevertheless, science and religion each search for and share a love for truth, which researchers from both disciplines pursue by utilizing the emotions of wonder and awe.

Whether people identify as religious, spiritual, or secular, they all experience the mystery of reality and feelings of being part of a larger wholeness through the human emotions of wonder and awe. Spiritual and religious practices as well as many scientific fields employ these emotions as starting points for reflection and inquiry. Moreover, wonder and awe possess qualities that complement, enhance, and affect multiple disciplines of study, which makes them valuable and essential emotions for human beings to experience Ultimate Reality as well as explore and learn about the natural world. The emotions of wonder and awe also inspire innovations in emerging artificial intelligence technologies. Rapidly developing artificial intelligence capabilities suggest the possibility that one day conscious artificial general intelligence may exist. With appropriate programming and sufficient data, artificial general intelligence would likely become a significant source of knowledge about the physical, chemical, and biological world. However, the prospect that advanced artificial general intelligence might possess consciousness, sentience, and self-awareness directs scientists and religious scholars to investigate and rationalize the possibility that conscious artificial general intelligence might be capable of wonder and able to experience awe of the Divine.

2. Wonder, Awe, and the Divine

Although a variety of human experiences elicit wonder and awe, religious encounters with the Divine produce transformative, lasting changes in people's attitudes, behaviors, and worldviews. For theists, the object of wonder is God or Ultimate Reality; thus, affective

experiences of awe reaffirm a religious person's belief in a supernatural deity. Religion is generally the sole source of spirituality for many people; nevertheless, non-religious people wonder about and express sacred truth in several ways. Both groups may experience awe as "a deity, a spirit, a universal consciousness, or some other construct, depending on the belief system of the individual" (Allen 2018, p. 18). Even though the type and source of an encounter differ, actual occurrences, along with remembering previous spiritual experiences, elicit awe from non-theists as well as theists. Religious adherents recall explicit sacred and life-or-death events while awe for non-religious people arises from spiritual experiences in nature or through yoga and meditation.

Religious beliefs, diverse cultures, and historical consciousness all shape and condition the emotions of wonder and awe. Religions attempt to satisfy humanity's wonder regarding questions about life's origin, meaning, and purpose through sacred writings and rituals that associate faith with awe during encounters with spiritual beings or Ultimate Reality. In the Hindu Bhagavad Gita Scriptures, Arjuna expresses astonishment when the charioteer reveals his true Divine form as Lord Krishna. Stories of the prophets in Hebrew Scriptures describe reactions of reverence, fear, and wonder when in the presence of Yahweh. Muslims relate Muhammad's fearsome meeting with the angel Gabriel. Similarly, Christian sacred writings recall Mary's wonder during Gabriel's visitation and how Saul was overcome with awe after encountering the risen Jesus Christ.

2.1. Wonder and Awe as Emotions

As human emotions, wonder and awe engender epistemic as well as spiritual experiences. They encourage scientific and theological discovery that shifts a person's attention toward other people, nature, beauty, or the Divine. Although often used interchangeably, awe and wonder are distinct. Wonder has a reflexive function; it attempts to understand the world by deliberately seeking information about the unknown. Thus, wonder requires sustained intellectual interest and creative, abstract thinking about novel, unusual, or unexplained phenomena. René Descartes perceived wonder as admiration because it does not originate from desire or aversion; instead, it acts as a catalyst for emotional transformation (Widdison 2022, p. 9). For Thomas Aquinas, wonder is the cause of pleasure because it facilitates gaining knowledge that a person desires to possess (Aquinas 2006a, ST II-I, q. 32, 6). Additional emotions associated with wonder include surprise at the unexpected, appreciation of something beautiful or magnificent, and curiosity, which generates abundant, often superficial questions. Yet, unlike curiosity, wonder focuses on evidence that relates or connects to the bigger picture. When wonder reveals the mysterious or the Divine, it manifests awe.

Unlike wonder, awe is an initial, direct, complex reaction to novel or extraordinary occurrences so astounding that a person is unable to comprehend and mentally reconcile them with existing perceptions of the world. An experience of awe creates "a little earthquake in the mind, a moment of cognitive malleability offering a chance to expand and reconstruct one's mental model of the world" (Shiota 2021, p. 87). Consequently, human cognitive processes require intellectual accommodation, which involves shifts or "changes to existing mental schemas in order to mentally process and integrate an experience" (Yaden et al. 2018, p. 3) that inspires awe. The failure or success of accommodation, along with the perceived source that produces awe, elicits either peace and enlightenment or fear and anxiety. Astronauts, for example, report that viewing the Earth from space generates positive responses of awe, while extreme weather events or mysterious, eerie, unusual situations frequently result in negative reactions.

Some people are more predisposed to awe than others. Extroverts and individuals who seek experiences of beauty, creativity, love of learning, gratitude, and religiousness generally report higher incidents of awe. A survey involving "western Christians, Buddhists, and atheists found that Nature (54%), Science, (30%), Music/Art (12%), and Human cooperation (8%)" (Caldwell-Harris et al. 2011, p. 659), as well as recalling previous spiritual and religious experiences, were most likely to stimulate feelings of awe, whether or

not a person was affiliated with or actively engaged in a religious tradition. Additionally, people comfortable with cognitive ambiguity appear to be more open to altering their worldviews after mystical encounters with the Divine, insights about the cosmos, or other awe-inspiring events.

Along with changes in perception, experiences of awe generate a variety of physiological, psychological, and social effects. Initial responses to remarkable events produce involuntary vocal sounds, such as "wow" or "oh," and facial expressions involving "some combination of an open, slightly drop-jawed mouth, widened eyes, and raised inner eyebrows" (Allen 2018, p. 11). Chills and goosebumps, accompanied by increased respiration and heart rates, are additional physiological reactions. One psychological consequence of awe is the notion of vastness that occurs from observing sweeping landscapes or the cosmos, contemplating life's meaning and purpose, or wrestling with complex social issues or scientific theorems. Hence, "anything that is experienced as being much larger than the self, or the self's ordinary level of experience" (Allen 2018, p. 8) elicits feelings of limitlessness. A deep appreciation for fine art and music, as well as extraordinary religious and spiritual events, also create sensations of vastness associated with awe.

Occurrences of awe likewise produce psychological thoughts of being in the presence of something greater than oneself or part of an inclusive wholeness that people often associate with Ultimate Reality or God. A spiritual encounter with the Divine is "something beyond that which we can understand adequately. . . an awesome, stupendous presence that cannot be expressed adequately in human words" (Berry and Clarke 1991, p. 11). Subsequent self-reflection about one's place in the universe creates a diminished sense of self, which occurs frequently during mystical experiences or when recalling past religious or spiritual events. Contemplating notions of vastness and being part of an inclusive wholeness also generate feelings of humility, which encourage "a realistic and secure sense of the self, alongside an appreciation of the value and contributions of others" (Allen 2018, p. 29). Both non-religious and religious people experience humility after an awesome event; however, the former sometimes require additional cognitive accommodation since religious people are able to incorporate spirituality and awe more easily into their concepts of reality.

Resultant self-diminishment and humility foster a spiritual interconnectedness with humanity and the larger world. Studies demonstrate that awe causes people from individualistic cultures "to feel closer to more people [and] people from collectivistic cultures to feel closer to those already in their network" (Allen 2018, p. 31). These findings suggest that awe's ability to evoke the small self and to form relationships is universal, which yields positive social effects. After experiencing awe, people tend "to volunteer their time to help others, to prefer experiential purchases over material ones, and to report greater satisfaction with their lives" (Allen 2018, p. 30). Acts of generosity and volunteerism seem to be related to the effect awe has on the perception of time slowing down or expanding. This notion of time distortion implies that time is plentiful, so people become mindful of living in the moment, which reduces stress and increases well-being, flourishing, and happiness.

2.2. Wonder and Awe in Religious Traditions

Most religious traditions encourage a personal transformation of awe through ritual prayer and meditation, meaningful engagement with others, and aesthetic responses to nature and art. Catholic sacraments and liturgy, for example, reinforce wonder and awe by facilitating encounters with Divine presence, and through the meditative internal awe of awakening, Siddhartha becomes an enlightened Buddha. Religious practices "not only ritualize the experience of wonder but are also objects of wonder in themselves" (Roberts 2014, p. 183). Religion encourages people to seek Ultimate Reality and to embrace what is other, whether the other is divinity, humanity, nature, or beauty.

Consequently, the emotions of wonder and awe are significant aspects of many religious traditions. In Judaism, awe is essential for understanding God and the world. In fact, "awe, rather than faith, is the cardinal attitude of the religious Jew" (Heschel 1959, p. 77), who simultaneously feels elation and humility. A balance of both reactions is necessary;

otherwise, one's approach to God is either too arrogant or too cowering. When people encounter the world with awe, Holiness emerges as a relational property urging people to imitate God who is Holy. Notions of awe in Islam also reflect a reverence-fear response to Allah. The Qur'ān states that "From among His servants, it is only those who know [have knowledge] that fear Allah" (A'Lā Mawdūdī 2007) and in Sufi hadith "The beginning of wisdom [or knowledge] is the fear of God" (Nasr 1993, p. 468). Hence, when a Muslim loves, fears, and humbly stands in reverential awe of Allah, the believer's actions, speech, and moral values align with the Qur'ān.

Christians focus on the Divine Mysteries, which stimulate curiosity, wonder, and awesome fear of the Lord. Similar to Judaism and Islam, Christianity differentiates between the servile fear of obeying God's laws to avoid punishment and virtuous fear, which is obedience to God's laws because they are good and foster right relationships (Aquinas 2006b, *ST* II-II, q. 19, 2, 4–6, 8). Ideally, by engaging in prayer and ritual, meditating on the scriptures, and performing good works, self-centered fear changes to Other-centered awe. Theologian Rudolph Otto additionally posits that experience of the Holy (numinous) or the Divine is essential to religion. The awesome wholly other nature of the Holy is offset by the allure of the Divine, which leads a person to desire an intense, reciprocal relationship with the Holy (Otto 1917, pp. 13–23, 26). God's sacredness, however, cannot be reduced to or completely expressed merely through the human experiences of wonder or awe.

The practice of Hinduism has a well-developed description of awe as one of the nine *rasas*, which are human emotions, moods, or feelings. The *adbhuta rasa* encompasses Sanskrit meanings of amazement, awe, wonder, and astonishment. Wonder is the experiential core of *rasa* itself: it "is a reaction to the opportunity to witness Divine, heavenly, or exalted phenomena" (Roberts 2014, p. 183) and is the central moment of devotional worship, the moment of seeing and being seen by Divinity. Spiritual encounters with the Divine may produce fear when meeting the goddess Kali or awe at seeing Vishnu in his immense glory. Buddhists prefer to use the term reverence rather than awe or wonder. In Buddhism, all beings are interrelated and all have the potential to be enlightened; therefore, everything should be revered. Most forms of Buddhism also acknowledge a sense of sacred presence and absence, a dichotomy that intensifies reverence for all beings.

In Confucianism, awe of heaven, honorable men, and wisdom is essential for authentic, virtue ethics conduct. Adherents of Shinto "worship what they are awed by, which they identify often as *kami*, namely, Shinto's gods [that] are believed to dwell in nature, living humans, concepts, and ancestors" (Inoue 2013, p. 63). Awe for indigenous peoples is more phenomenological. Some Australian First Peoples use a bullroarer during rituals because the rumbling sound evokes awe and symbolizes the powerful presence of ancestors. For the Pit River People of Northern California, life is a "continuous religious experience [because the essence of religion is] the 'spirit of wonder,' the recognition of power as a mysterious concentrated form of nonmaterial energy" (de Angulo 1926, pp. 353–54). They believe this awe-inspiring power exists in all objects to varying degrees.

Although wonder and awe are aspects of Divine reverence in many religions, people who identify as spiritual but not religious likewise feel awe, wonder, mystery, self-diminishment, and part of a larger purpose through spiritual activities. People not affiliated with religious traditions are more comfortable with spiritual experiences, so they engage with nature to connect with phenomena more significant than themselves. Evidently, "there is something very native and visceral about our need to feel this connection, even if it's completely secular" (Paulson et al. 2021b, p. 53). Emotions of wonder and awe help make these connections.

3. Wonder, Awe, and Scientific Inquiry

Spiritual experiences also function as a bridge between religious and scientific perspectives about wonder and awe. Wonder, whether about the Divine or about the world, leads to questions, observations, and further investigation about the unknown. Plato and

Aristotle taught that all academic inquiry starts with wonder. They perceived wonder as an intellectual virtue because it "arouses the intellect and directs it towards objects that are seen as intellectually understandable and decipherable" (Kristjánsson 2019, p. 128), yet just beyond the edge of knowledge. Albert Einstein concurred that the mysterious unknown "is the source of all true art and science. He. . . who can no longer pause to wonder and stand rapt in awe, is as good as dead: his eyes are closed" (Einstein 1931). For religious people, awe engenders humility before the Divine, while scientists express feelings of "intellectual humility [demonstrated by] a willingness to change beliefs when confronted with conflicting information related to the need for cognitive accommodation" (Allen 2018, p. 28). Geneticist Francis Collins, for example, experienced awe while mapping the human genome and mathematician Srinivasa Ramanujan claimed that "an equation for me has no meaning unless it expresses a thought of God" (Kelderman 2023, p. 7). Awe and wonder recognize and address supernatural agency as well as increase affinity for secular, scientific explanations of the world.

While these emotions often pertain to spiritual experience, wonder and awe also inspire scientific endeavors. In fact, wonder may be "a core element of the scientific mindset" (De Cruz 2020, p. 156) since it initially motivates people to become scientists, and then encourages continued exploration and research. In interviews, professional scientists admit that along with wonder, awe is an important aspect of their work; they associate it with the process of scientific discovery, especially new realizations or "eureka!" moments. Researchers likewise experience awe as part of the global scientific community, through recognition of their work, and from "the opportunity to share their findings and participate in the broader scientific enterprise" (Cuzzolino 2023) both worldwide and across multiple generations. For scientists and technologists, awe is a motivator and the reason they persist in such challenging work. Even though "awe was not associated with having 'faith' in science, just in understanding how science works" (Allen 2018, p. 35), theistic scientists may be more open to the possibility of supernatural theories. Experiences of awe, however, have almost no influence on non-theists' opinions regarding supernatural versus scientific suppositions.

Additionally, awe and wonder draw scientists out of their comfort zones by encouraging creativity that exposes gaps in scientific understanding and generates paradigm shifts to bring about scientific transformation. Animated with wonder, researchers develop cognitive attitudes, value the objects of study, "encourage a receptivity to the unusual and the novel, reduce reliance on stereotypes and scripts, and increase critical thinking" (De Cruz 2020, p. 163). Once energized by awe, scientists experience a heightened awareness of everything around them; they lose focus on themselves and ignore the passage of time. Through observation and the process of investigation, scientists also realize their limited knowledge, especially in western societies where information is primarily analytical in nature. Because analysis operates on existing facts and data, it has limits. Awe extends those limits by opening the mind to new understanding, consciousness, and a sense of humility; for "what we cannot comprehend by analysis, we become aware of in awe" (Heschel 1965, p. 89). Consequently, wonder and awe divulge information through inquiry and experience that complements logical analysis and fosters conceptual changes to existing scientific theories. Wonder sparks imagination and introspective reflection thereby motivating researchers to attain missing knowledge that completes or enhances comprehension. Thus, wonder within the scientific disciplines promotes awe and humility and then provides starting points for new inquiries that create additional wonder.

3.1. Wonder, Awe, and Methodology

Many scientific fields, along with spiritual and religious practices, employ methods of observation, experimentation, and analysis that evoke wonder, which leads to eventual comprehension and insights with the potential to produce a sense of awe or amazement. The nature of the object being studied, however, determines which mode of knowing is appropriate to it. Physical or cognitive sciences, for example, study the natural world or

the mind, respectively. They utilize research methods that differ from how religion and theology approach the supernatural from academic and faith perspectives. The emotions of wonder and awe, however, traverse religious traditions, the sciences, and situations in daily life. Driven by intellectual curiosity and wonder, repeatable scientific methods with consistent, verifiable experimental data create general, widely accepted theorems. Unfortunately, no universal theological method exists because each religious tradition possesses a unique way of developing tenets that initiate awe of the Divine. Interreligious consensus on methodology is also difficult to achieve due to diverse cultural, metaphysical, and social perspectives, in addition to lingering adversarial, historical relationships among faith traditions. Moreover, unlike innovative scientific discoveries that often result in discarding previous ideas, religious traditions prefer to integrate new concepts or correct distortions within their doctrines.

Even though scientific and religious methodologies are different, they contain some similarities. Both disciplines leverage previous research and knowledge to generate new ideas, greater understanding, and novel perspectives. Using the scientific method, researchers begin with wonder, inquiry, and observation, which leads to questions that challenge current understanding. Next, they evaluate existing logical and mathematical models to predict (hypothesize) new possibilities. Scientists deduce anticipated results, and then design and perform experiments to test their hypothesis. If experimentation yields new insights or an awe experience, scientists update their existing models and mental schemas to assimilate the new data, and then repeat the process if necessary. Religious scholars likewise employ some semblance of the scientific method by wondering and inquiring about notions that challenge existing tenets and presuppositions within their own or other faiths. They evaluate doctrines and scripture using historical-critical methods and engage techniques from anthropology, geology, archeology, and other sciences in order to form a hypothesis with the possibility of new insights. Next, scholars deduce possible answers to unresolved questions and experiment with various ideas to achieve greater understanding and resulting awe about religious beliefs. If necessary, they also repeat the process.

3.2. Science and Religion Relationship

The academic disciplines of science and religion possess their own methodologies and contextual frameworks; yet, a mutual, complementary relationship exists between them in their quest for logical and sacred truth. The association is symbiotic in that "science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes" (John Paul II 1988). Moreover, deep religious convictions influenced many scientific discoverers, including Galileo, Newton, and Einstein. These scientists reconciled potential conflicts by admitting, as Einstein did, that "science without religion is lame; religion without science is blind [since] science can only be created by those who are thoroughly imbued with the aspiration toward truth and understanding" (Einstein 1954, p. 46). In fact, because science and religion share a global nature, "we need to recognize that the borders between science and religion are more permeable than most people think" (Einstein 1954, p. 46). Religion reminds science to wonder about the interconnected world that contains physical and spiritual components, in order to prevent science from reducing or limiting the world to only empirical results. Scientific logic, supported by repeatable evidence, stops religion from spiraling into superstition and pseudo-awe.

While science and technology best describe the physical world, perspectives from metaphysics and religion are necessary for a comprehensive account of reality. Philosophers and theologians consider the original purpose of metaphysics to be a "wonder-filled encounter of the human with the Mystery of Being" (Lasher 2011, pp. 194–95), which provides insights into nature, personhood, and consciousness as well as some notions about meaning and purpose. Einstein considered religion, science, and art as branches of the same tree whose roots of wonder and awe "stimulate discovery, spiritual contemplation, and artistic expression" (Paulson et al. 2021a, p. 39). The continual search for scientific

discoveries is similar to religious practices and rituals; each creates habits that cultivate awe and wonder. Regardless of whether the object is divinity, humanity, art, nature, artificial intelligence, or other scientific theories, wonder and awe result in cognitive adaptations as theologians and scientists attempt to understand and assimilate new information into their respective worldviews. Hence, wonder and awe, with their associated emotions of curiosity and amazement, encourage theistic and scientific explanations of the world.

The phenomenological character of awe and wonder has additional implications for the relationship between science and religion. Both disciplines acquire understanding and experience awe through "'a legacy of wonder' [where] wonder is the '*semen scientiae*,' the seed of knowledge" (De Cruz 2020, p. 164). Moreover, science and religion share an unquenchable sense of wonder. Science reveals the wonders of creation, which humbles believers and fills them with awe of the Divine. Religions employ wonder to evaluate the morality of scientific discoveries and to suggest ethical boundaries for emerging, awe-inspiring technologies. Hence, the science–religion relationship encourages interdisciplinary dialogue that confirms religion's "credibility and the effectiveness of its apologetic function with regard to contemporary science in the modern world" (Worthing 1996, p. 210). Through wonder and awe, religious traditions prompt scientists to develop beneficial discoveries that promote human flourishing while science challenges religion to reevaluate and potentially reformulate long-standing theological tenets.

4. Wonder, Awe, and Artificial Intelligence

Innovative scientific theories and their associated emerging technologies, especially in the areas of quantum computing, artificial intelligence (AI), and transhumanism, cause theologians and technologists to wonder in amazement at humanity's ability to understand and manipulate the natural environment. Imagining future discoveries also elicits awe about possible applications from these fields of study. The rapid development of AI, for example, has great potential for humanity. Yet, increasingly advanced technology also raises questions about the nature of the human mind, consciousness, and personhood. Current instances of artificial intelligence do not have consciousness nor exhibit the emotions of wonder or awe. Nevertheless, scientists and religious scholars are working to rationally determine whether artificial intelligence someday might be capable of consciousness, sentience, and self-awareness, three conditions necessary for nascent AI to possibly express wonder and experience awe of the Divine. Prospective technological advancements in artificial intelligence derive from knowledge and understanding about the human mind. Throughout history, philosophers and scientists have been fascinated with how the human mind works and have wondered whether animals or inanimate objects might possess some form of intelligence. Industrial applications for groundbreaking technologies, such as electronic computing, programming algorithms, and standardized networking protocols again prompted scientists to wonder whether machines could think. Alan Turing, in 1950, devised a test to determine whether a computer might exhibit intelligence comparable to humans, and six years later, John McCarthy introduced the term "artificial intelligence" (König et al. 2022, p. 19). Breakthroughs in brain research, intelligence, and neurology inspired the creation of innovative computer architectures with neural networks that would eventually train themselves. Early AI applications took advantage of faster CPUs, inexpensive memory, and neural network technology modeled after the human brain.

Presently, all existing artificial intelligence is artificial narrow intelligence (ANI), which refers to computationally intensive systems that autonomously perform singular, specific, albeit complex tasks, as per their programming instructions. Initial versions of ANI are reactive or limited memory machines. People were awestruck when IBM's machines Deep Blue and Watson along with DeepMind's AlphaGo program beat world class chess, Jeopardy!, and Go game champions, respectively. Artificial narrow intelligence now utilizes machine learning, especially deep learning, which automatically extracts information from huge datasets, and then trains its neural networks by analyzing and adjusting billions of parameters in order to detect relevant patterns among complicated connections that are

often unrecognizable to the human brain. Motivated by curiosity, researchers developed generative AI deep-learning models, such as ChatGPT and Bard, that learn to predict linguistic patterns from large language models, rather than from grammar rules. Generative AI utilizes natural language processing to calculate probabilities that produce statistically likely results from huge amounts of diverse information. Artificial intelligence, per se, therefore derives from accurately assessing probabilities from patterns of data, rather than through reasoning or logical thinking.

Technologists continue to wonder whether humanlike machine intelligence is possible and are working to develop artificial general intelligence with the ability to access and correlate numerous inputs from multiple, large datasets. Someday AGI might be able to perform comparable-to-human-level thinking, reasoning, and common sense on a broad range of subjects. Additional projected AGI capabilities include incrementally learning how to solve new challenges, plan for the future, adapt to change, and potentially possess self-awareness. Self-aware AGI, "which is decades, if not centuries away from materializing, is and will always be the ultimate objective of all AI research" (Joshi 2019). Such highly cognitive AGI is anticipated to exhibit an individual personality and consciousness along with needs, emotions, beliefs, and thought processes that influence decisions, motivations, and desires. However, to possess a conscience and experience emotions, such as wonder and awe, AGI systems would likely need to be embodied in robots equipped with biomimetic sensors, so they could "maintain relations with their environment and exhibit some sort of situational awareness" (König et al. 2022, p. 21) for interacting with the world and its inhabitants. AGI-embodied robots do not currently exist.

Artificial general intelligence will also require imagination, wonder, and curiosity, rather than mechanical one-step-at-a-time instructions and probability calculations, in order to develop and test new hypotheses that challenge established scientific paradigms and religious doctrines. Sequential decision-making steps imply notions of fate or predestination and lack spontaneity. Therefore, freedom of choice and a wide range of emotions are necessary for AGI to appreciate, as humans do, the "aesthetically beautiful, the experience of awe, wonder, and of transcendence that signals human beings have a destiny and a spiritual dimension [that includes] the immorality of the human soul. . . [which facilitates] interaction between the Divine and the human" (Wood 2020, p. 88). The possibility that AGI might manifest these capabilities raises numerous theological questions, including whether AGI could possess a conscience along with a soul and whether AGI might be capable of transcendence and thus should experience awe of the Divine. Furthermore, as AGI would continually self-improve through successive iterations, artificial general intelligence may evolve into artificial super intelligence (ASI), which could exceed the human brain's cognitive abilities, thereby creating what is popularly known as the technological singularity. Artificial super intelligence is hypothetical, yet it introduces complex philosophical, moral, ethical, and legal concerns along with the numerous challenges of integrating fully conscious, self-aware AGI or ASI among humans in society.

4.1. Conscious Artificial General Intelligence

The technology to create conscious artificial general or super intelligence is daunting, especially since the human mind and consciousness are complex, multifaceted phenomena that are not fully understood. Most scientists comprehend that the mind rapidly correlates numerous multi-sensory experiences, stimuli, and events into memories; yet, they have vague definitions of the mind and consciousness, which leads to misunderstanding. Neuroscience provides some evidence about the nature of consciousness because human brain neural activity reacts differently to various tasks and states of consciousness, such as during prayer, meditation, sleep, surgery under general anesthetics, and in comatose or vegetative states. Moreover, neurology research indicates that relational complexity appears to develop within the human brain's prefrontal cortex (Robin and Holyoak 1995, p. 988). As gradual relational understanding occurs, each person discerns perceptions and experiences emotions from external and internal events, leading to complex self-relation and inter-

personal associations (Welker 2010, p. 160). Yet, consciousness is ultimately a subjective experience, so "it is not possible to verify the presence of consciousness in another brain [since] we cannot enter into another being's mind" (Buttazzo 2008, p. 141). Human beings nevertheless recognize consciousness in other humans who exhibit similar behaviors and possess brains with functioning neurons. Identifying artificial consciousness will be more difficult because humans cannot experience or know authentic non-human consciousness and there is no reason to expect AGI and human consciousness will be similar.

Sentience is a form of consciousness associated primarily with experience and emotions. All sentient beings are conscious; however, conscious beings may not be sentient if they are unable to feel emotional or bodily sensations through interactions with the world. Most organisms with a central nervous system are capable of physical feeling and are therefore sentient. Complex organisms, such as humans, have a capacity for pain and pleasure, which enables an extensive range of emotions that motivate behaviors, such as fight or flight reactions to other people or to external environmental factors. Shaped by cultural influences, human emotions are adaptive responses; they modulate social interactions and well-being, facilitate memory creation and perception, and are an essential part of reasoning, deliberation, and the decision-making process. In order to possess some form of sentience, AGI would need a nervous system to supports the unique physiological responses of awe and to experience pain, suffering, and the mixed emotions of wonder, joy, and sorrow that human beings feel when confronted with their finitude.

Another aspect of consciousness is self-awareness, a multilayered perception of one's personality, values, and relationships that contributes to human intelligence and identity. Self-awareness involves being cognizant of one's emotions, thoughts, self-image, and goals. People with a sense of self have purpose and goals that correlate with their morality and life choices. They are also aware of their place in the world and experience a sense of wonder at the world's actual existence, its thereness or being, because it is not how things are in the world that is mystical, but that the world exists (Wittgenstein 1922, p. 89). Although science attempts to explain the mystery of being and existence, religion enlightens people to this wonderous awareness, which results in awe of creation and humility before the Creator. With huge amounts of data and deep-learning, artificial intelligence might acquire a concept of the Divine; however, programming and training AI on the notions of Mystery and Being, along with the capability for wonder awe, is significantly more problematic.

Human cognition combined with wonder inspires awe, which surpasses perceptible experiences of awareness even as it expands consciousness. Artificial narrow intelligence, however, appears to lack wonder and the ability to experience awe. ANI waits for stimulus or questions and is therefore reactive and responsive rather than curious, aware, and inquisitive; whereas, human wonder is stimulus-independent. Scientists and technologists also determine AI motivations, objectives, and knowledge through careful programming and selective datasets. Hence, artificial intelligence operates without motivation, subjective values, or personal goals, which are essential for ethical decision-making, as are prudence, judgment, wisdom, and intuition. Such practical knowledge and coping abilities extend beyond computational and analytical skills because this experiential information derives from life events and situations involving predicaments too numerous to capture within training datasets. Thus, the question remains: would artificial general intelligence be conscious, self-aware, and able to feel or would AGI only mimic human thoughts and emotions?

4.2. Artificial Intelligence and the Divine

Catholic theologian Hans Urs von Balthasar offers some intriguing insights regarding the question of AGI consciousness, self-awareness, and responsiveness to the Divine. Balthasar describes the self as developing awareness and wonder through a four-step or four-fold process of distinction. These four distinctions represent the structure and Mystery of Being (or existence) and include the distinction between self and other existents, the distinction between Being and all existents, the distinction between essence and existence, and the distinction between God and world (Lasher 2011, p. 198). The first distinction

reveals the self's difference-in-relation to the other, while the second extends the relation of all others as interdependent on Being (existence), per se. The third distinction entails the difference between essence and existence, which involves "the most radical and original distinction. . . between the way a thing is and the fact that it exists at all" (Lasher 2011, p. 200). Distinguishing between the infinite subsistent Source of Being (i.e., God or the Divine) and non-subsistent being (existence), in which all others participate, is the fourth and final distinction. For some religious traditions, these distinctions indicate an asymmetrical, yet dialogical, relational structure of existence expressed as Divine Love, which includes spirit as well as matter and "confers upon everything (animate and inanimate) the composite wholeness and integrity of a subject. For they are 'subjects of being' within a living cosmos" (Schmitz 2005, p. 31), thereby revealing the experience of existence as a gift and as a community of subjects, rather than objects.

Balthasar includes non-human and inanimate entities as sources of wonder contributing to human self-awareness. Although he is referring to entities existing in the natural world (e.g., animals, trees, and stars), by extension, AI and other human-created technology might be included if emerging technologies one day develop artificial general intelligence capable of consciousness. Human and non-human inter-subjectivity "takes on profound, even startling dimensions of reciprocity [especially if] the human subject is 'configured' receptively to the non-human entity of nature [or possibly of conscious AGI], and these in turn are 'receptive' to their 'idea' in God, which at once is immanent in them yet transcends them" (Lasher 2011, p. 201). Reciprocity discloses the dialogical structure of reality and existence. Because existence manifests in the awareness of others, to participate fully in reciprocity with humans or the Divine, artificial general intelligence would require consciousness, self-awareness, and the ability to reveal Divine Love as self-gift. Moreover, since the object becomes a reciprocal subject, AGI would need to be conscious, to exhibit wonder rather than merely be reactive and reflective toward humans and other entities, and to experience awe of the Divine.

5. Conclusions

Almost all religious traditions as well as scientific and other non-spiritual endeavors entail a sense of wonder and awe. Both emotions encourage human beings to contemplate and appreciate the known and unknown phenomena of creation. Through the transformative aspects of wonder and awe, religious, spiritual, and secular people experience profound cognitive accommodation as they realize that the natural world is an amazing place of mystery, which inspires a reverent search for knowledge even as it reveals the Divine. During experiences of awe, scientists and religious scholars encounter the unknown at the boundaries of understanding. Then, wonder takes them beyond the edge of what is knowable where suppositions eventually develop into a sense of meaning.

Whether inspired by art, nature, science, or religion, wonder leads to further cultural, technical, and spiritual human growth and development. Experiencing awe redirects the focus away from oneself and toward the other so that a person no longer feels isolated but rather an integral part of a larger wholeness. Realizing a sacred and secular connectedness and then reacting with humility has important implications for ethics, social justice, and human flourishing. Thus, the emotions of awe and wonder facilitate a deeper understanding of and interaction with the physical and spiritual world. Wonder and awe stimulate new questions and introduce novel aspects of reality to explore. Current forms of artificial intelligence lack the ability to experience scientific wonder or spiritual awe of the Divine. Researchers and technologists are optimistic about developing artificial general intelligence with consciousness, self-awareness, the ability to experience powerful, subjective emotions, and an extensive understanding of reality. Consequently, one wonders what conscious AGI's first query might be.

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