CHAPTER 10

Spiritual Resonance in a Virtual Age

Hildegard of Bingen's Scivias *and the Limitations of Digitized Primary Resources*

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The COVID-19 pandemic has shed new light on the ways in which our professional lives are entwined with technology. As remote work and learning arrangements arose alongside lockdowns and related public health measures, dependence on virtual modes became more intimate and complex. In line with these trends, public and academic libraries across North America are placing great emphasis on the acquisition of e-books, online journals, and other electronic resources. After all, these materials pose several advantages in the current techno-economic climate: they are convenient, quick to order, and readily available to library users who are accessing collections remotely. However, in my time working as an academic religious studies librarian, I have come to find that my community does not always share in this enthusiasm for screen-based research. To provide context for these observations, I will engage in a close study of the *Scivias*, the first major work by the

visionary Saint Hildegard of Bingen. Through this inquiry, I argue that the desktop-based interfaces that are used to mediate access to digitized primary resources in and beyond the library dilute what I refer to in this chapter as *spiritual resonance*: the process of thinking, feeling, and intuitive understanding by which individuals come to attune to an information artifact's network of symbolic meaning.

I begin by reflecting on how my experiences working with researchers as a liaison librarian inspired me to write this chapter. Next, I summarize the extraordinary life of Saint Hildegard of Bingen and discuss how the *Scivias* provides us with a microcosmic snapshot of the cosmology of the High Middle Ages. To tie this history back to contemporary librarianship, I draw on the communication theory of Marshall McLuhan to explore how our current digital devices reinforce a mode of visual perception that accents disaggregated content over aesthetic form. I proceed to show how these design biases mirror certain metaphysical assumptions from the modern era by relating Hildegard of Bingen's holistic cosmology to the process philosophy of Alfred North Whitehead. To conclude, I discuss how Virtual Reality (VR) technologies can be used to provide more immersive and interactive experiences for library users. While I cannot hope to offer a comprehensive solution to the many complications that the pandemic poses to our profession, I hope that my chapter helps to reframe this uncertain moment in a way that is meaningful and constructive.

Reflections from the Pandemic

As a young librarian whose career began during the pandemic, I do not have enough experience to speak of how my normal routines were disrupted by COVID-19. But despite my newness to the profession, the social and economic shifts catalyzed by the pandemic have led me to reevaluate many of the habits I have taken for granted throughout my working life. At the time of writing, I hold the position of General Librarian at the University of Manitoba, a major research University located in Winnipeg, Canada. In this role, I act as liaison librarian for a group of academic subjects associated with St. Paul's College, a Catholic higher education institution affiliated with the University of Manitoba and endorsed by the Canadian Province of the Society of Jesus. The University of Manitoba Libraries (UML) supports a community of approximately 30,000 students across two major campuses.

UML is included in the U15 group of Canadian Research Universities established in the 1990s to advance collaboration in the postsecondary sector. The breadth of our collections helps set UML apart from other institutions in the U15. We are fortunate to have access to a substantial selection of digitized primary resources through world-class platforms like HathiTrust, Artstor, and Gale Primary Sources. Using this technology, library users can, for example, pull up a virtual re-creation of a Renaissance painting with stunning color and accurate scale. Within seconds, they can move on to peruse an illuminated manuscript from medieval Europe, using high-resolution IIIF imagery to view pages with greater fidelity than the human eye is capable of perceiving.[1] While these digital tools have made it easier than ever to appreciate the wisdom of the past, their apparent convenience comes at a cost.

The rapid spread of COVID-19 across the globe in early 2020 pressured the higher education sector to undergo a rapid and multifaceted transformation in many of its traditional operations. At my institution, the most dramatic shift was the initiation of a cross-campus transition to remote learning that saw many daily workflows moved to video conferencing platforms like Zoom, Cisco WebEx, and Microsoft Teams. In this context I was hired by UML to provide remote library services for a variety of arts and humanities subjects including Catholic Studies and Religion. In a period spanning the better part of 2021-2022, I met with researchers from a variety of academic programs who were using UML's collection of digitized primary resources to work on course assignments and complete dissertation work. During these meetings, researchers commonly chose to connect with me via video conferencing applications on their desktop computers, laptops, and smartphones. While these conferencing tools were not created with library reference work in mind, I found them to be acceptable for most situations, particularly one-on-one conversations. Nevertheless, there was something about the process of working with primary resources in a remote environment that felt cold, lifeless, and rigidly formulaic to me. This chapter constitutes my most recent attempt to unpack the mixed feelings I hold toward digital technology. In an effort to determine the root cause for my frustrating experiences working remotely, I was inspired to investigate some pivotal events in the history of science, philosophy, and cosmology that shaped the digital media environment in which I found myself immersed.

The Life of Saint Hildegard of Bingen (1098-1179)

Throughout the history of scholarship on the High Middle Ages, the insights reported by female mystics have been dismissed by an ecclesiastical community threatened by powerful proclamations born of direct visionary experience (Bynum 1990, 1). Despite this patriarchal discrimination, Saint Hildegard of Bingen went on to become one of the most well-known and influential women of the entire medieval period (Clark 2016, 120). While I can only render a minuscule fragment of her genius here, I hope that this chapter serves as a window through which the larger spirit of her oeuvre might be glimpsed.

Hildegard of Bingen was a multidisciplinary polymath whose legacy of work forms an interlocking matrix of poetry, philosophy, herbology, musical composition, and linguistics. While it is common for significant religious figures to be obscure during their lives, the many gifts that Hildegard possessed become even more fascinating when we see how widely they were recognized during her earthly tenure (Clark 2016, 120). Today, one of the principal biographical sources that we have on Hildegard's life is the *Vita Sanctae Hildegardis* or *Life of the Saintly Hildegard*, a hagiographic text posthumously compiled by the monks Godefridus of Disibodenberg and Theodoric of Echternach in the twelfth century. In the centuries since these monks set down their mythic account, scholars have gleaned more precise information about Hildegard's life from her own autobiographical letters (Newman 1998, 4). Contemporary medievalists now estimate that she was born somewhere between August and September 16, 1098, in present-day Germany (Embach 2021, 13). Her parents were Hildepert and Mechtild, members of the free nobility who maintained a close relationship with the powerful counts of Sponheim (Embach 2021, 14). In the first book of the *Vita Hildegardis*, the young Hildegard is introduced as an unusually mature and pious child who experienced "forms of secret visions" from an early age (Godefridus of Disibodenberg and Theodoric of Echternach 1999, 26). On November 1, 1112, at about the age of 14, she entered a monastic community at Disibodenberg in a small, female enclosure attached to a larger community of male Benedictine monks (Embach 2021, 11). There, she was educated and spiritually mentored by the noble anchorite Jutta of Sponheim, who she succeeded as magistra of this community at the age of 38 (Embach 2021, 14). Hildegard writes that after turning 42, she received divinely inspired instruction to write

down the visions she had been experiencing since childhood in a resounding "voice from Heaven" (Hart and Bishop 1990, 59). In suitably mythic fashion, she initially refused this divine call, only acquiescing to her larger spiritual fate when she came down with a severe illness, a calamity she believed to be directly correlated with her rejection (Embach 2021, 21). Over the course of a decade, Hildegard began sharing her visions publicly and set off to found her own monastery at Rupertsberg near the town of Bingen (Embach 2021, 23). It was during this period that she blossomed as a writer and teacher and began working out the subtleties of her theological vision across a series of visionary tomes.

Introducing the Scivias

The *Scivias*—the shortened title version of *Scito vias Domini* or *Know the Ways of the Lord*—is Hildegard's first major textual work. It consists of three books comprising 26 visions in which a path to spiritual salvation is laid out in the stately tenor of a prophet. Many scholars agree that during the later years of Hildegard's life, she commissioned a group of nuns to create a series of painted images to accompany her writing (Bain 2018, 143). During the twelfth century, these materials were compiled as part of a series of illuminated manuscripts alongside much of Hildegard's written correspondence and musical composition (Bain 2018, 143). This collection came to be known as the Rupertsberg Codex or *Risencodex* and remains an authoritative primary source for medieval historians today. While the 30 Years' War was raging across the Rhineland in the seventeenth century, a group of Rupertsberg nuns took the *Risencodex* with them while fleeing the conflict, eventually storing it in a nearby house Hildegard established around the year 1165 (Bain 2018, 144). Here it lay until the monastery was closed towards the beginning of the nineteenth century and the collection was transferred to the Wiesbaden State Library in Germany (Bain 2018, 144). Unfortunately, the original *Scivias* was lost during the bombing of Dresden in 1945 and is now thought destroyed. Luckily, a hand-painted facsimile was created by the nuns of Hildegard's abbey between 1927 and 1933, and black and white copies of the original were generated during the 1920s (Campbell 2021, 260).

According to Margot E. Fassler (2022), the *Scivias* remains relevant to contemporary readers because of the comprehensive way that Hildegard communicates the medieval worldview. This dynamic aesthetic and literary style was unique for its time and provides us with "otherwise unattainable knowledge" about the High Middle Ages (Fassler 2022, 1). One way to appreciate the scope of what Hildegard presents to us in the *Scivias* is by considering it as a work of cosmology. While, today, this word has come to be associated with the discipline of astrophysics, the fields of science, theology, mythology, and art had not yet been separated in Hildegard's time, and they formed "part of a grander scheme of knowing" (Fassler 2022, 12). For this reason, we would do well to adopt Fassler's broader definition of the term as "the study of the origin, evolution, and future existence of the universe" (2022, 13). Barbara Newman describes the *Scivias* as a "multimedia work" in which a nexus of verbal and visual relationships come together to "enhance the text and heighten the visionary message" (1990, 25). For each experience recounted in the *Scivias*, Hildegard begins by describing what she "saw" and proceeds to unfurl her deeper theological and doctrinal understanding of the vision based on what she "heard" (Chatterjee 2011, 136). As such, the paintings have a distinctly didactic character and draw heavily on the visual vocabularies that permeated Christian Europe in the twelfth century (Campbell 2021, 259). To grasp these vocabularies, it will be helpful to familiarize ourselves with some of the basic cosmological ideas that structured the medieval mindset.

The Cosmology of the High Middle Ages

For those who live in large metropolitan cities, it is easy to become disconnected from the cavernous depths of the night sky. With distractions like light pollution, urban infrastructure, and the ceaseless hum of industrial machinery, we tend to lose awareness of the immediate fact that we are hurtling through space on a constantly revolving organic sphere. But if we take a moment to step away from our busy routines and gaze into the stars, we can learn to experience the wonder of our cosmic predicament in a way that feels both timeless and deeply inspirational. Over the course of centuries, a vast array of human cultures have conjured the inexhaustible mysteries of the heavens through narratives, mythologies, and traditional stories. For

this reason, studying how a given culture conceives of the stars can help to map the underpinnings of their cosmological perspective.

For a person living in twelfth-century Europe, it was common to think of Earth as the stationary center of a series of eternally revolving concentric spheres. The terrestrial world was thought to consist of the four classical elements of Hellenistic philosophy: earth, water, air, and fire (Brasher and Lewis 2001, 23). Above this were spheres corresponding with the seven classical planets—The Moon, Mercury, Venus, The Sun, Mars, Jupiter, and Saturn (Brasher and Lewis 2001, 23). At the farthest reaches of this vast holarchy were the "spheres of the fixed stars and the Prime Mover," marking the liminal boundary separating our observable world from the subtle realms of saints and angels (Brasher and Lewis 2001, 23). Though few of us still ascribe to this cosmological perspective, its traces are present today. For example, the names of the seven weekdays used in many languages including English, French, Arabic, and Portuguese are derived from the seven classical planets and their associated symbolic meanings (Brown 1989, 536). In the *Scivias*, Hildegard draws on this epic geocentric cosmology and depicts our Universe as a grand symbolic totality—in her words, a manifestation of "not just the things that are visible and temporal, but also the things that are invisible and eternal" (Hart and Bishop 1990, 94). A telling example of Hildegard's celestial orientation can be found in book one, vision three, in which the emanating forces of cosmogenesis are described in a section entitled "Das Weltall" or "The Universe" (1990, 91-105). In a vision passage cited below with parenthetical annotations from medievalist Peter Dronke (1985), Hildegard recounts a visionary experience where she perceived the primordial universe as a vast egg encircled by a shell of living fire:

> I saw a huge structure, rounded and shadowy, in the likeness of an egg: narrower above and below, and in the middle wide. Encircling its outer part was a lucent fire, having a kind of shadowy skin below it. In that fire was a ball of sparkling red flame (i.e. the sun), so great that the entire structure was lit up by it. Three torches were ranged in order above (i.e. Mars, Jupiter, Saturn), which with their blaze held the ball in place lest it should slip. (97-98)

While an analysis of this passage's deeper theological meaning goes beyond the scope of this chapter, we can see from Dronke's commentary how its language refers to the geocentric worldview

that was common at the time. But due to the metaphysical nature of this cosmological backdrop, it is difficult for present-day readers to understand the ideas that the work was originally created to convey. For this reason, I argue that when experiencing illuminated manuscripts like the *Scivias*, we must learn how to tune in to this broader network of meaning via a process of thinking, feeling, and intuitive understanding I call *spiritual resonance*. Material inscriptions like written text and painted imagery can work to facilitate this act of symbolic attunement. But in the same way that a broadcast of Beethoven's Ninth Symphony cannot be located in the mechanical parts of a radio receiver, the meanings invoked by the *Scivias* cannot be deduced from the markings on its pages.

Spiritual Resonance

The notion of spiritual resonance might strike those who have been educated within a modern scientific worldview as unorthodox. This result is likely because it breaks with the metaphysical doctrine of *physicalism* that has characterized scientific thought since the seventeenth century. Physicalism is the idea that all natural processes—including those of human learning and perception—can be explained by locally occurring physical causes (Kelly 2015, xii). While modern science has proven that physical causes play a crucial role in many material, chemical, and biological processes, a growing body of interdisciplinary evidence is challenging some fundamental assumptions of the physicalist perspective.[2] One example is the quantum mechanical notion of entanglement, or nonlocality, which physicists David Bohm and Basil Hiley define as "the intimate interconnection of different systems that are not in spatial contact" (1975, 93-4). While nonlocality has remained a controversial idea since it was proposed by quantum physicists in the mid-twentieth century, it has now been firmly recognized by the physics community as "a fundamental feature of the universe" (Keepin 2023, 7). In 2022, the Nobel Prize in Physics was awarded to doctors Alain Aspect, John F. Clauser, and Anton Zeilinger for a group of experiments that empirically demonstrated the existence of entangled quantum states (The Royal Swedish Academy of Sciences 2022).

While the role that entanglement plays in the macroscopic universe has yet to be determined, developing what Bohm and Hiley

(1975, 93) call an "intuitive understanding of nonlocality" can help us to understand how readers attune to historical works like Hildegard's *Scivias* through spiritual resonance. Resonance—which derives from the Latin *resonatia*, meaning echo—occurs when different processes vibrate together at the same frequency (Davis 2019, 112). Musicians are likely familiar with the concept of resonance from the rehearsal room. When a vocalist belts a high C through an amplified public address system, nearby instruments tuned to the same pitch will vibrate in unison, even after the original sound has subsided. While this example illustrates the phenomenon of local resonance, the spiritual resonance I am considering is nonlocal and functions independently from space-time distance. Though this may sound strange, it is not unprecedented. An everyday example of nonlocal resonance can be found in the operation of memory. Let us imagine we are walking through the stacks of an unfamiliar theological library as part of a professional conference. As we pass through the entryway, we catch a certain musty smell that triggers a long-forgotten childhood memory of reading Robert Munsch's *Love You Forever* on our grandmother's lap. Stirred by waves of nostalgia, the recollection inspires us to enter the stacks to look for that same book to read it once again. The important thing to note here is that the two events—the present smell and the past memory—are linked by symbolic meaning rather than spatiotemporal proximity. Nevertheless, the past event retains causal efficacy in the present and can trigger us to make choices that affect the future in a measurable way. Similarly, I hypothesize that information artifacts function like embodied memories, transmitting their meaning across time and space. Aesthetic qualities like color, calligraphy, layout, texture, weight, and size modulate the intensity of these echoes of meaning. At this stage, I am not claiming to have proven this hypothesis or identified the precise process behind it. Nevertheless, I hope that the idea appeals to readers' intuition and serves as a theoretical inspiration for future research.

While working with postsecondary researchers during the pandemic, I found that the computer interfaces that academic libraries use to mediate access to digitized primary resources interfere with spiritual resonance. To understand why, we can take a closer look at the design principles that inform the structure of our current virtual work environment. Many of the undergraduate students with whom I connected over video conferencing had a difficult time navigating UML's collection of online primary resource guides. While I cannot speak for every student, I expect that a great deal of this

confusion had to do with the platforms that libraries use to share virtual materials. At UML, for example, most of our subject guides have been created using the Springshare LibGuides content management system, an industry standard for academic and public libraries worldwide. The program is designed to help libraries organize information resources by type, class, and subject and uses a grid-like layout optimized for a digital work environment based on the desktop metaphor. The desktop metaphor consists of a group of design principles that have come to define human-computer interaction since the rise of operating systems like Windows and macOS in the late 1980s (Kaptelinin and Czerwinski 2007, 1). Today, the main features of the desktop metaphor are so ubiquitous that they are almost invisible–overlapping rectangular windows, applications optimized for mouse and keyboard functionality, and a hierarchical layout that emphasizes the linear presentation of text and imagery (Kaptelinin and Czerwinski 2007). However, the user interfaces that younger students have become accustomed to from their smartphones and other touch-based devices are moving away from the emphasis on linear text and static imagery that characterizes desktop computers. Nevertheless, many web applications in and beyond the library encode and reproduce the desktop metaphor in their basic design. As a result, the spiritual resonance of primary resources like the *Scivias*– which predate the modern office environment entirely–is diluted in intensity.

For example, in a digitized edition of the *Scivias* created by the Benedictine Abbey of St. Hildegard, text and imagery that were originally presented as an integrated whole are given as separate components, optimized for modern web browsers (n.d. [a]). In "The Universe" section, Hildegard's prose is rendered in a clean Helvetica font, and the accompanying painting of the cosmic egg is compressed as a freestanding PNG image that can be interacted with using a mouse and keyboard (Benedictine Abbey of St. Hildegard n.d. [b]). From a purely quantitative standpoint, it is difficult to see how this disaggregated presentation impacts the overall meaning of the work. After all, image resolution is high enough to perceive the most striking details of the original painting, and Hildegard's phraseology is preserved with a suitable degree of accuracy. In short, when we limit ourselves to analyzing the measurable text and imagery on the page, no perceptible information has been lost.[3] But with works like the *Scivias*, the formal arrangement of visual, textual, and aesthetic material plays a significant role in the way symbolic meaning is communicated to readers. In the *Scivias*, deep

cosmic truths are invoked through awe-inspiring images that reflect a dynamic, interconnected, and highly intelligent universe. To fully appreciate the integral cosmology that the work puts forward, it is important that its various components are experienced as an aesthetic gestalt.[4] Unfortunately, when these illuminated pages are viewed within interfaces optimized for an office environment, it becomes much more difficult to attune to their symbolic power. In my opinion, the critical factor limiting desktop-based interfaces has to do with the way they prioritize *content* (namely, linear text and static imagery) over the form, texture, and scale of the original resource. Furthermore, I believe that these tendencies mirror certain metaphysical biases that were introduced into Western thought when the holistic medieval cosmology that the *Scivias* epitomizes was being replaced by the modern scientific worldview. By chronicling these broader historical movements, I believe that we can understand how our most general intellectual assumptions become part of the tools we use to communicate.

Media Ecology and the Birth of Modern Science

Throughout human history, cosmological narratives have provided a way to situate matter, life, mind, and spirit within the vast mystery of universal process. As we have already seen, the cosmological worldview that thrived during the High Middle Ages saw humanity, divinity, and the natural world as an interconnected whole. However, during the period spanning the mid-sixteenth and late-seventeenth centuries, a series of scientific discoveries and socioreligious revolutions rocked the foundations of this perspective. As philosopher Richard Tarnas describes in his classic *Passion of the Western Mind*, by the beginning of the eighteenth century, the European medieval worldview had been almost entirely replaced by a modern scientific cosmology in most academic institutions. This new worldview was defined by heliocentrism, impersonal laws of nature, and an understanding of our world as a "complex mechanical system, composed of material particles" (Tarnas 1993, 270).

The interpretive lens of media ecology can be used to better understand the role that communication technology played in this cosmological transition. The field of media ecology derives from the Toronto School of Communication (TSC), pioneered by Walter Ong

and Marshall McLuhan in the mid-twentieth century (Rushkoff 2012, 10). The term was originally coined by cultural critic Neil Postman to bring together the many theoretical orientations influenced by the TSC that study how "media of communication affect human perception, feeling, understanding and value" (Postman and Weingartner 1971, 139). In its early conception, media ecology was premised on the idea that the five human senses form a *sensorium* or perceptual field (Miroshnichenko 2016, 171). In the language of McLuhan, the media we use to communicate extend and/or diminish the ratio of senses in this field by "externalizing" them in the form of technology ([1962] 2017, 299-300). For example, we can think of the telescope as an extension of the human eye which employs mirrors and lenses to modulate the way patterns of light flow into our retinas to be communicated to our optic nerves and translated into the visual imagery we experience. Douglas Rushkoff—summarizing the work of McLuhan and the media ecology tradition—argues that once a communication medium becomes dominant in a cultural milieu, it proceeds to shape the way "people, ideas, and institutions interact" (2012, 10). For example, in *The Gutenberg Galaxy*, McLuhan traces the emergence of several perceptual biases that were introduced into European societies by the printing press. For our purposes, the most important of these was the formation of a "fixed point of view" through the "isolation of the visual factor in experience" (McLuhan [1962] 2017, 145). McLuhan thought that print media's characteristic insistence on visual uniformity and the linear presentation of information played a key role in the formation of "Newtonian space and time and mechanics" and the mechanistic paradigm of classical physics ([1962] 2017) 306). As the scientific revolution intensified in the eighteenth and nineteenth centuries, the linear and vision-centric worldview shaped by print reached a new level of sophistication and complexity. It was in this context that the field of library science was developed as a means of organizing the vast amount of typographic material that was being generated by modern institutions. To explain how this modern mechanistic worldview is mirrored by the desktop-based interfaces we use today, I'd like to introduce the process philosophy of Alfred North Whitehead, a pivotal yet largely underappreciated thinker of the late modern period.

Nature in Process

Alfred North Whitehead was a British mathematician, logician, and philosopher who pioneered the field known today as process philosophy (Desmet and Irvine, 2022). As an accomplished mathematician, he was among the first intellectuals to grasp how the developments of twentieth-century science—namely, relativity and quantum mechanics—necessitated a thorough rethinking of the foundation of classical physics and the mechanistic philosophy that informed it. As a result of these scientific upheavals, he shifted his focus away from the realm of pure mathematics in the later years of his life and laid the groundwork for a relational metaphysics "rooted in creative process" that he called the philosophy of organism (Segall 2021, 42). Key to the philosophy of organism is the idea that the mechanistic interpretation of physics was based on an unexamined metaphysical error inherited from Aristotle and imported into modern science by enlightenment philosophy. Simply put, this was the idea that the natural world could be understood by reducing it to a substratum of fundamental units or substances, static things that require nothing other than themselves in order to exist (Kraus 1998, 1-2). In classical physics, this substance metaphysics was used to construct the basic conception of atoms. The atoms of modernity were conceived of as indivisible and insentient particles of matter (possessing a finite location and mass) that interacted with one another according to a fixed and impersonal set of universal laws (Kraus 1998, 12).

In contrast to this classical view, Whitehead thought that the natural world could be conceived of in a more general way—as a weave of epochal processes called *actual entities* or *actual occasions*. Each actual entity can be thought of as a finite "drop of experience" engaged in a self-creative process that Whitehead described as concrescence ([1929] 1978, 18). These interlocking patterns of concrescence unfold through a related process called prehension. Prehension can be likened to a primordial form of feeling that involves an actual entity sensing the data of its environment, selecting those aspects that are most relevant to its subjective aim, and organizing these impressions into a novel perspective on the world ([1929] 1978, 22-3). In contrast to the isolated atoms of classical physics, these actual entities are "fundamentally constituted by their various relations with other actual entities" and cannot be considered in abstraction from the environment in which they are instantiated (Scarfe 2009, 2). It is not

substances that are considered enduring in Whitehead's philosophy, but formal patterns (or *eternal objects*) and the relationships existing between them. Whitehead did not deny that the abstractions derived from substance metaphysics had a definite pragmatic value. Rather, he was more concerned with the way that modern thought had reified the abstract idea of substance as a "logical and/or linguistic category" and taken it to be a fundamental property of the natural world (Kraus 1998, 2). In *Science and the Modern World*, he aptly labeled this "accidental error of mistaking the abstract for the concrete" the "fallacy of misplaced concreteness" ([1925] 1997, 51).

Whitehead thought that by committing this fallacy, modern mechanistic cosmology had dissociated individuals from the organic depth of everyday experience. Like Hildegard of Bingen before him, Whitehead understood nature as an unbroken continuum, a living plenum in which individual parts flow into and reflect the whole (and vice versa). To be more specific, we could say that both Hildegard and Whitehead present us with cosmologies based on a fractal understanding of nature. The term *fractal* was coined by the mathematician Benoit Mandelbrot in the 1970s to describe a family of shapes that demonstrate self-similar patterns across scale. The recursive quality of fractals can be likened to a musical octave, when the same series of notes repeat themselves at different frequencies. In *The Fractal Geometry of Nature* ([1977] 1983), Mandelbrot shows how a variety of natural patterns including snowflakes, coastlines, and many varieties of plant life reflect this fractal geometry.

In book 1, vision six of the *Scivias*, Hildegard describes an awe-inspiring experience where she witnessed an army of celestial entities arranged in a mandala-like pattern. This text and its accompanying image (Unknown Author, ca. 1151-1179) depict an elaborate geometry whose intricate, symmetrical features can be likened to a fractal:

> I saw in the secret places in the heights of Heaven two armies of heavenly spirits who shone with great brightness. Those in one of the armies had on their breasts wings, with forms like human forms in front of them, on which human features showed as if in clear water. Those in the second army also had wings on their breasts, which displayed forms like human forms, in which the image of the Son of Man shone as if in a mirror. (Hart and Bishop 1990, 139)

Further descriptions from this section enrich our understanding of the highly complex visual scene. For example, Hildegard speaks of

an additional rank of entities positioned towards the center of the vision that "seemed to be full of eyes and wings" (Hart and Bishop 1990, 139). To add yet another layer of numinosity to her description, she elegantly recounts how "in each eye appeared a mirror and in each mirror a human form" (Hart and Bishop 1990, 139). Recall that Whitehead described the basic constituents of our cosmos as actual entities, drops of experience that each form a unique perspective on the universe by prehending the perspectives of the other actual entities in their environment ([1929] 1978, 18). Hildegard's descriptions of mirrors within eyes gives us a poetic sense of what a process-relational cosmos would look like if viewed from a transpersonal vantage point.

Comparing the insights of Whitehead and Hildegard in this way can help us understand the limitations posed by current digital interfaces. As we learned from McLuhan, communication technologies reinforce certain perceptual patterns by modulating ratios between the five human senses. In the digitized edition of the *Scivias*, we saw how the Benedictine Abbey of St. Hildegard used plain text and freestanding PNG images to generate a reproduction of the original manuscript that emphasizes visual uniformity (n.d. [a]). Rather than reproducing Hildegard's pages as they were originally arranged, text and image are presented sequentially, like items on an assembly line. The modern mechanistic worldview–while not present in the content–is encoded in the medium itself. The neutral, uniform, and highly linear aesthetic of the desktop environment mirrors the modern tendency to represent nature as an insentient machine that can be analyzed, measured, and dissected into its isolated components.[5] By way of contrast, the illuminated version of the *Scivias* derived from the Rupertsberg Codex was created in a predominantly oral culture that understood the natural world as the unbroken creation of a vast cosmic intelligence. For this reason, content and form work together to communicate a message of universal interconnectedness, divine providence, and spiritual inspiration.

The organic worldview presented by Whitehead synthesizes elements of both the medieval and the modern perspectives. His vision of a universe in constant motion resonates with the Hildegardian notion of a living, interconnected, and deeply creative cosmos. At the same time, his careful analysis of time, space, matter, and energy is fully consistent with the empirical findings of modern science. In this way, adopting a process-relational perspective can help information professionals design interfaces that reflect the seamless fluidity

of nature without sacrificing the precision that current technologies afford us. Furthermore, as digital technologies continue to evolve in the coming decades, process-relational philosophy can provide the theological and religious studies community with a framework for imagining how our field might adapt to the virtual work environments of the future. Thomas P. Moran and Shumin Zhai predict that the next era of computing will dispense with the emphasis on desktop metaphors that characterize contemporary computer software (2007, 335). Microsoft CEO Bill Gates also expects that human-computer interaction will shift significantly in the coming decades. For example, he predicts in a recent blog post that in the next few years, "most virtual meetings will move from 2D camera image grids…to the metaverse, a 3D space with digital avatars" (2021). In order for this transition to occur in libraries, our communities would need to have access to hardware and software that breaks with the two-dimensional desktop and convincingly situates users within a moving three-dimensional space.

The Promise of Virtual Reality

As the immediate impacts of COVID-19 subside, it remains uncertain whether remote services will become a permanent fixture of librarianship as a profession. Given the limitations of the desktop-based interfaces we have been considering, I conclude by offering some hardware and software alternatives that might help our community minimize their biases. Namely, I echo Diane H. Sonnenwald and Jason McElligot's claim that virtual reality—a form of computational technology that immerses users in a simulated construction of the natural world—could be used to improve the way library users interact with rare and historic book collections (2017). They argue that VR technologies can remedy the "primary focus on visual presentations" that limit current methods of digital engagement by providing the means for "integrated visual, haptic, auditory, olfactory and cognitive access" (Sonnenwald and McElligot 2017, 804).

Recalling the organic cosmologies of Hildegard and Whitehead, VR technology does not seem like an ideal way of nurturing the holistic sensory ratios needed to appreciate rich historical materials like the *Scivias*. On the contrary, VR headsets like the HTC Vive Pro, Valve Index, and Oculus Quest appear to amplify the dissociative effects

of digital technology by submerging users in their own isolated universes. While I do not believe this technology will ever stand in as a complete replacement for analog media, I do think it has the potential to facilitate spiritual resonance if intelligently integrated into existing library services. For one, VR technologies can provide libraries and archives with a way of making interactive digitizations accessible to audiences who are unable to access original source materials. For example, Brady D. Lund and Sherri Scribner describe how archivists at Emporia State University's Special Collection and Archives used VR to provide "a global audience of classrooms and individuals" with continuous access to the materials of renowned children's author May Massee (2019, 470). The team used a software called InstaVR and a Samsung 360 camera to create a circumocular image of their physical collection complete with interactive materials that users could investigate remotely. Interestingly, they describe how the project was instigated to address geographical challenges and make the collection more accessible to communities who were not physically on site. Furthermore, they explain how VR allowed library staff to utilize the technology's multimedia capacities to make their digital collection more engaging to users: "While a static digital object in a repository is passive, the virtual reality experience allows users to see the object on the shelf just like they would in-person and then click on that object and learn more by reading or listening to an audio clip" (2019, 477).

On top of mediating remote access, I can see VR technology being used to amplify the spiritual resonance of primary resources by building upon the material created by the original authors. Fassler hints at these possibilities in a presentation given to the annual meeting of the American Musicological Society in 2014. In this talk and an associated article, she describes working on a project that considered how scholars might work to "recreate the learned medieval imagination, with its many interlocking resonances" (Fassler 2017, 161). In collaboration with digital artist Christian Jara and a group of postsecondary music students, Fassler used the University of Notre Dame's Digital Visualization Theater to construct a virtual model of the medieval cosmos inspired by Hildegard of Bingen's visionary art and prose. This model, which took advantage of the theater's capacity as a planetarium, employed a sound system with 22 speakers and an immersive hemispherical display to depict the grand movements of creation that Hildegard conjures in her cosmological works (Fassler 2017, 161).[6] While VR technologies are not yet able to simulate the

feeling of being present in a physical theater, their circumocular headsets and capacities for multisensory engagement could be used to create similarly immersive experiences for geographically dispersed communities.

In addition to the curation of collections and the enhancement of primary resource materials, the sensory depth afforded by VR and other extended reality technologies could help to enrich the instructional programs offered by public and academic libraries. For example, Austin Olney describes how staff of the White Plains Public Library in New York implemented a form of augmented reality technology into a series of library classes directed at teenagers. Using a mobile application called Quiver, library users were provided with a way of rendering the pages of physical coloring books as "fully animated, three-dimensional models" (2019, 6). According to Olney, the implementation was simple to accomplish and generated an "overwhelmingly positive" response in the community (2019, 7). Similarly, Chad M. Clark, a new media librarian at the Highland Park Library, describes how his institution partnered with an external organization to provide programs on the theme of human nutrition supplemented by augmented reality technology. At the conclusion of each workshop, staff members gave participants access to an app called HoloAnatomy. Designed for the Google HoloLens, the software allowed participants to project the biological systems of the human body as interactive objects within their field of vision (2019, 22).

In a more elaborate example, Felicia A. Smith, the head of learning and outreach at Stanford University Libraries, lays out her plans to use VR to generate interactive experiences that provide library users with "the opportunity to erase physical boundaries and explore unknown worlds" (2019, 91). In a proposed instructional session on information literacy, users begin in an immersive nightclub environment and proceed to "advance to different levels by flying through wormhole effects" (Smith 2019, 93). Along the way, they encounter ambiguous news reports and learn how to distinguish "fake news" from legitimate sources of information in real time (Smith 2019, 93). While this technology is still in its infancy, these early applications give us a sense of how librarians and other information professionals can take advantage of the possibilities that the next generation of digital work environments will afford.

Conclusion

I hope that readers found this adventure through history, cosmology, and technology to be an illuminating experience. As the immediate impacts of the pandemic subside, the planetary community faces a much larger emergency: the looming threat of climatological collapse. As a result, many of us are experiencing feelings of fear, uncertainty, and alienation as a growing number of environmental processes pass critical turning points. Despite the severity of the situation, we need not resign ourselves to a state of hopelessness. As the great Catholic theologian Thomas Berry poetically wrote in *The Sacred Universe*, by coming to a "unified understanding of ourselves, of the universe, and all the forces present therein" we can still move towards repairing our relationship with the natural world (2009, 45). Though theological and religious studies libraries have a small role to play in this grand reconciliation, our unique position as community builders gives us the opportunity to plant the seeds of a more sustainable worldview in the hearts of future generations. The road ahead is plagued with uncertainty, yet the pandemic has taught us that we can meet the obstacles that beset us with creativity, collaboration, and an eye for the future.

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Notes

1 International Image Interoperability Framework or IIIF is a set of open standards used by many of the world's leading cultural institutions to deliver "high-quality, attributed digital objects online at scale" (International Image Interoperability Framework, n.d.). For example, the IIIF Image API can be used by libraries to enable "deep zoom" features on digital images that are compatible with a variety of web browsers, devices, and screen types.

2 Those interested in a comprehensive overview of these findings can refer to the anthologies Irreducible Mind (2007), Beyond Physicalism (2015), and Consciousness Unbound (2021) edited by Edward F. Kelly and colleagues.

3 In fact, the uniform nature of this desktop-based digitization allows for certain accessibility advantages. For instance, the HTML text can be translated into multiple languages using browser tools, and PNG images can be saved to a personal device for offline viewing.

4 While I am unable to reproduce pages from the original Rupertsberg Codex in this chapter, I have linked to a YouTube video that depicts a high-definition readthrough of a recent facsimile in the Reference list (Ziereis Facsimiles 2020).

5 In my opinion, these aesthetic qualities stem from the hardware layer of computers. The transistor relays in the central processing units of computers are based on the rigid categories of modern logic (Dixon, 2017). The structure of these systems of binary switches mirrors the modern tendency to view reality through a prism of static categories (true and false, positive and negative, sentient and insentient, etc.).

6 Interested readers can view a portion of this virtual model from 39:16 to 43:47 of the YouTube video linked in the works cited list (Fassler, 2014). Particularly moving is a sequence depicting the gradual assembly of Hildegard's "The Choirs of Angels" image as a three-dimensional domed mandala (41:37 to 43:10).