Zygon®: Journal of RELIGION & SCIENCE

Duffy, Kathleen. 2024. "Teilhard's Synthesis as Impetus for Greater Care for Our Earth." *Zygon: Journal of Religion and Science*. DOI: https://doi.org/10.16995/zygon.15246

Open Library of Humanities

Teilhard's Synthesis as Impetus for Greater Care for Our Earth

Kathleen Duffy, Professor Emerita of Physics and Director of the Institute for Religion and Science, Chestnut Hill College, Philadelphia, PA, USA, kduffy@chc.edu

Early in life, Pierre Teilhard de Chardin knew he must love both God and Earth with equal passion. Yet, it took him many years to formulate his famous phrase "communion with God through Earth," (Teilhard de Chardin 1968a, 57) and many more years to articulate in a profound way how the interaction of incarnation with evolution provides a framework for this formula. Today, it is recognized that a deeper sense of matter/spirit, of incarnation/evolution, allows the tapping into the sacredness of matter in a way that will motivate us to develop a flourishing humanity as well as a flourishing Earth. This article explores these concepts.

Introduction

There is no need to reiterate the long list of threats that beleaguer our planet, the difficulties that beset us on every side—racial discrimination, global poverty, the ravages of war—nor the growing number of events that indicate the severity of the climate crisis: diminishing natural resources, unhealthy air quality, polluted waterways, denuded forests, wildfires, violent storm. In new and dramatic ways, we are damaging our environment—either without realizing it or without caring enough about the consequences. Given the magnitude of the problem, we can easily become disillusioned, confused, and immobile, not knowing what to do next. Yet, rather than approach these challenges together, we often find ourselves and those around us polarized and ineffective. Unless we change the paradigm by which we operate as a human community, things will only get worse. In this article, I explore the components of a vision that could make a difference, a worldview that evokes a tremendous amount of hope and creativity, one that focuses us beyond the present moment and into the future, a worldview proposed and lived by Pierre Teilhard de Chardin.

Pierre Teilhard de Chardin, SJ

Teilhard was a Jesuit priest and paleontologist who lived during the first half of the twentieth century. Throughout his life, Teilhard faced numerous ordeals: he served as a stretcher bearer on the front lines during World War I; he struggled to integrate the science of evolution with his Christian beliefs and was forbidden by his religious superiors to speak about or publish his ideas; and perhaps most difficult of all, he experienced rejection of his most precious work by his Jesuit order and the church that he loved. He was very aware of the sufferings of humanity as well as of the difficulty involved in attempting to transform a worldview so deeply embedded in the psyche of a group.

Once, after contemplating the disasters of his world, Teilhard (1959, 136–37) shared his anguish: "On certain days the world seems a terrifying thing: huge, blind, and brutal. It buffets us about, drags us along, and kills us with complete indifference. At any moment the vast and horrible thing may break in through the cracks—the thing which we try hard to forget is always there, separated from us by a flimsy partition: fire, pestilence, storms, earthquakes, or the unleashing of dark moral forces—these callously sweep away in one moment what we had laboriously built up and beautified with all our intelligence and all our love." This description sounds all too familiar: natural disasters, dark moral forces, the destruction of a lifetime of effort. Yet despite the desperate tone of his prayer, Teilhard (1959, 137) is able to continue: "Since my dignity as a Human forbids me to close my eyes to this, that I may not succumb to the temptation to curse the universe and the one who made it, teach me to adore it by seeing you concealed within it. In truth, the huge and dark thing, if we want it to be so, is

you! You have told me: 'It is I, do not be afraid.' The immense hazard and the immense blindness of the world are only an illusion to the one who believes."

How was Teilhard able to see Christ in the midst of a world in chaos? Do his words seem overly optimistic? Are they unfounded? Or are they the fruit of mystical insight? Teilhard's faith in the future depended on several things: his contemplation of nature, his understanding of the dynamic cosmic processes that operate in our world, his ability to imagine and feel Christ's presence and action in the world, and his belief that the incarnate Christ is empowering the forward movement of evolution both at the heart of matter and from the future. His faith in the evolutionary process pointed the way, stirred his creativity, and helped him imagine approaches to the problems and crises he faced, many of which we still experience today.

As a child, Teilhard wondered why living things die while rocks seem to be more permanent. He spent the rest of his life pondering a profound question: "What holds everything together?" At first, he began collecting anything that seemed hard and dense—scraps of iron that he stored in the barn near his home and visited regularly for worship. Once he realized that iron rusts, he switched to the hardest and most beautiful specimens of rock he could find. He eventually decided to pursue a career in geology and paleontology, a choice that afforded him much time in the field, where he could contemplate the beauties of nature and the structures of our planet.

As he searched for fossils and chipped stone, Teilhard (1978, 198) touched Earth at its most intimate level. In an early essay, he writes: "I have always loved and sought to read the face of Nature; [however,] my approach has not been that of the 'scientist' but that of a lover." Nature nourished him. It was a catalyst for his mysticism. He sometimes could even feel the divine presence animating and directing everything.

Evolution

During his years in the Jesuit seminary, Teilhard discovered the theory of evolution and immediately realized its potential for enhancing the theology he was learning at the time, a theology that seemed static in comparison. The connections between the theory of evolution and the Christian doctrine of the incarnation provided him with possibilities for developing a synthesis of science and religion as well as a more cosmic theology. In the first chapter of his Gospel, John tells us that, at the beginning of time, the Word Incarnate plunged into matter, descended into its deepest depths, penetrated to its very heart to be present to all things at all times for a single purpose: to hold all things together (John 1:1–5). Ideas such as these are also found in the epistles of Paul, who clearly refers to a cosmic Christ (Ephesians 1:9–10; Colossians 1:15–17). These connections led Teilhard to understand that Christ, who is embedded in matter, is ever encouraging creation to overcome its inherent

resistance to transformation and guiding creation from within as it ascends toward ever greater integration and consciousness. Furthermore, by the power of the Resurrection, the cosmic Christ has gone ahead of us into the future and reappears at the focal point of the evolutionary project, alluring all things into a profound unity. Seeing Christ at work in the world in such a powerful way allowed Teilhard to hope in the future.

During World War II, Teilhard began to apply his synthesis to world problems. He realized that unless humans know and internalize the dynamics of the universe of which we are part, we can easily cause more difficulty when we try to change things. Without a more holistic and dynamic understanding of our evolutionary cosmos, of the process by which we have arrived at this time and place, we walk blindly into the future. The perils that face us will continue to haunt us. For instance, even today as we connect globally, we continue to identify too narrowly with family, political party, nation, religious group, etc. Instead, Teilhard would advise us to grow to a world scale and think of ourselves as terrestrians.

So how does our universe work? Where did it come from and where is it going? Teilhard's scientific research helped him discover answers. In his major work, *The Human Phenomenon* (1999), he weaves a detailed story of the cosmic becoming with facts about the evolution of matter, but he also looks for meaning and direction, for the physical and psychological dynamics by which the universe forms and the importance of relationship throughout.

It is now understood that in the beginning, shortly after the Big Bang, all that existed were simple elementary particles in a very hot, dense, and expanding environment. Protons darted about repelling each other since positively charged particles do not want to be close. But, in an atmosphere of extremely high pressure, some of the protons ended up so close to each other that the strong nuclear force took over, and they fused into more complex particles such as heavy hydrogen and helium. The electromagnetic force complexified matter further by encouraging nuclei to unite with electrons to form atoms, which later combined into molecules, leaving the early cosmos full of gas and dust particles. Even though the universe has been expanding since the beginning of time, the force of gravity has been attracting the gas and dust scattered throughout space and drawing it together to form the galaxies, each of which contains billions of stars.

In the cores of the stars, the strong nuclear force once again encouraged relationship between particles. At first, heavy hydrogen fused into helium, then later carbon and nitrogen formed, and eventually, so did many of the other elements needed for life. This process can happen only in the extreme heat and pressure found in the stellar cores. Once life appeared on Earth, complex molecules formed cells that then joined to form living organisms; eggs and sperm produced living individuals. And the process of emergence continues. It

is intriguing to notice that elementary particles become interesting only when they interact, when they are in relationship with other particles.

Creative Union

A unification process has been at work throughout the universe's long history. Teilhard called this process creative union: whenever entities come together and bond without losing their identity or integrity, they create something of greater complexity. More complex and novel structures gradually emerge from the union of simpler structures. Union is happening everywhere. In fact, Teilhard found that a thrust towards union seems to be coded into the very fabric of the cosmos: particles of heavy hydrogen fuse into helium; nuclei unite with electrons to form atoms; atoms combine into molecules; cells join to form organisms; egg and sperm produce a new living individual. What is significant about the process of creative union is that when individual elements interact, they find themselves capable of more than had they been acting alone.

Teilhard further proposed that once a new entity is formed by creative union, it becomes capable of greater consciousness. Teilhard calls this the law of complexity-consciousness. He also noted that spiritual bonds, like their physical counterparts, grow ever stronger as matter becomes more and more conscious. These laws of creative union and complexity-consciousness govern the forward movement of spirit as surely as the laws of physics, chemistry, and biology. They also eventually become a mandate for humanity's path to accomplishing what Teilhard calls the great work of union. They encourage us to implement union, the most important and fundamental process in the cosmos (Teilhard 1968b, 44–49).

Particle physicists who probe the hidden depths of matter notice that elementary particles are interactive, always on the move, ever ready to relate by way of the fundamental laws of physics. It is relationship that causes spurts of complexity and diversity. This means that relationship is at the heart of the universe, and interdependence, rather than independence, is its hallmark. For Teilhard (1968b, 45), "to be" is to be in relationship. This might be obvious at the human level where love is clearly the unifying element, but it is just as true at the elementary particle level.

But the processes of creative union and complexity-consciousness are not without struggle. Although some forces do foster union, others can be destructive. They can increase the entropy of a system, deplete and waste the potential scope of physical and spiritual creative energy. Processes of transformation in nature are often initiated in an atmosphere of violence. For instance, nuclei fuse only in an atmosphere of extreme heat and pressure. Chemical reactions can be explosive. However, rather than impeding progress, conflict between these

forces often drives the system to something new, something more complex, and provides the impetus for ever-greater organization.

Creativity

The emergence of life on planet Earth some four billion years ago represents a turning point that initiates ever-greater complexity and consciousness. Plants and animals acquire new characteristics, new ways of relating and communicating, new ways of practicing creative union. Many species of fish, insects, and birds engage in collective behavior to carry out a common task. Swarm behavior, a particularly interesting example of this, is practiced by starlings. A flock of starlings flies as a single bird, contracting and expanding, soaring up, and then diving down into the trees. This flock has no single leader. Instead, it is a decentralized system in which the flock's cohesive movement is created by interaction among the birds in the flock as a whole. Researchers have spent years photographing and analyzing the movements of large flocks of starlings. Using sophisticated software, they determine the three-dimensional position of each individual bird, and with a computer model, simulate their movement in order to study how the movement of a given bird is affected by its neighbors. The researchers found two very interesting results: first, each bird stays equally distant from its seven nearest neighbors so that as one bird moves, the rest of the flock needs to adjust. This ensures flexibility of the flock shape while allowing expansion and contraction of the flock. Second, birds at the edge of the flock tend to bunch closer together. This behavior actually constricts the flock so that it tends to fly as a whole in the same general direction (Miller 2010, 163–79).

Swarm behavior is a creative and effective unification strategy that enhances starling survival. A pressing need—escape from a predator—drives the starlings to respond, to interact coherently. Because each individual bird accepts a goal larger than itself, the flock can cooperate in a highly organized way. Clearly, the flock is more than the sum of thousands of starlings; instead, it is a self-organized dynamical system. Intelligent behavior emerges from the flock as a whole.

The Human

With the coming of the human, almost fourteen billion years after the Big Bang, consciousness reached another milestone, a new phase of development. The human is gifted not only with the power of co-reflection but also with the potential to share both knowledge and feeling with others, share information through time and space, see back in time, have a sense of history, and thus see beyond what other lifeforms are able to see. The convergence of one human's thought with that of others allows for an ever-growing compendium of both

physical and psychic knowledge. Humanity is becoming capable of experiencing a sense of the whole, of seeing into the future and predicting the direction of the cosmos, of making choices that will ensure flourishing for all.

Union has been the hallmark of the evolutionary process, and it is ours to encourage in ever more important ways. Co-reflectors can establish effective moral codes, set up plans of action that will lead to a flourishing future, and initiate integrated and practical approaches to what is the greatest global crisis of all times. As human freedom and heightened consciousness intensify, greater responsibility becomes essential. And in a world that is evolving both physically and spiritually, humanity is obliged to act. The cosmos depends on humanity as a whole, not simply on the individual.

Teilhard imaged the structure of human consciousness as an intricate fabric that silently, almost imperceptibly, envelops our Earth—as an intricate web of thought that makes up humanity's collective heart-brain in which threads of spirit weave matter's psychic component, producing a tangle of fibers of ever greater novelty, held together by the ultimate bonding force in the universe, which is love. Its threads of spirit weave matter's psychic component with matter's physical component and produce a tangle of fibers of ever greater novelty, held together by the ultimate bonding force in the universe, which is love. He called this web of consciousness the Noosphere. The internet, which today facilitates almost instant communication among peoples throughout the world, provides a visual image of this collective heart-brain, of humanity's nervous system, of this "halo of thinking energy" (Teilhard 1999, 125).

Teilhard (1959, 168–80) has compared the evolutionary front, on which the human phenomenon is playing out, to the battlefront of World War I, where he and his fellow soldiers experienced feelings of freedom, unanimity, and exhilaration as they confronted its dangers together. With a goal greater than his own wellbeing and with the support of his fellow human beings, Teilhard felt himself part of humanity, part of a process that was leading somewhere. The front became for him a symbol for "the boundary between what Humanity has already achieved and what is striving to emerge, between what we are already aware of and what is still in process of formation" (Teilhard 1965, 203–4). It is a place of creativity where novelty can emerge, where we are moved to become ever more conscious of our role in the world and to act in accordance with this responsibility. To stand together at the evolutionary front of human consciousness is to dare to give all to its forward movement. Teilhard hoped that humanity would come to realize the power of a group united around a single purpose for the good of the planet. Today, as we experience so much lack of care for our environment, we have an issue that deserves our total attention, one that needs our primary focus.

Chaos

Although many of us long for a life of peace and equilibrium, scientists have noted that, in the physical world, transitions to novel forms never happen when systems are in equilibrium. In fact, change happens only in an atmosphere of instability and high energy, in that particularly creative region that scientists call the *edge of chaos*. At the edge of chaos, a complex system responds to the invitation to change, interacts with the environment, searches for new ways to stabilize, and produces something new. There is a fine boundary, then, between equilibrium and turbulence called the edge of chaos where new forms are generated. But the system must be driven far from equilibrium in order to reach the edge of chaos (Gleick 1987, 119–53).

One of the reasons chaotic systems are so creative is that they experience positive feedback. Negative feedback is useful for stabilizing a system, maintaining it in equilibrium. For instance, a thermostat keeps the temperature of a room fairly constant. When the thermostat senses that the temperature of the room is too cold, it turns the heater on; when it senses the room is too hot, it turns the heater off, maintaining a sort of equilibrium. But unlike negative feedback that works to stabilize, positive feedback amplifies small changes, driving a system away from equilibrium into a state that is unpredictable, which is usually seen as negative. This is the case with global warming, where each poor decision causes further degradation of the environment. However, when the system reaches the edge of chaos but before it becomes turbulent, positive feedback can be a mechanism for transformation—usually to a state that is not only unpredictable but also totally unexpected.

Computer scientists who track the development of chaotic processes have come up with galleries full of graceful patterns that they call strange attractors, patterns that plot the development of chaotic systems. They notice that, even though systems at the edge of chaos are unpredictable and free to roam about, they are not turbulent. Instead, they are attracted to an invisible center and held within a boundary.

Although Teilhard would not have known the theory behind complex systems, he was very aware of the phenomenon. Instead of thinking of evolution as a gentle drift toward equilibrium, he saw it as an irresistible vortex spinning humanity into ever-greater consciousness. He realized that the instabilities that confront us provide opportunities for the change that can lead us forward along the evolutionary path. For Teilhard, instability is a signal that change is needed.

Teilhard sensed what contemporary scientists are finding in almost every branch of science—that driving a system far enough from equilibrium can facilitate union. When things go smoothly, there is no incentive to change and thus no drive to create something new. Change results only when a system is driven far from equilibrium by blocks to progress, by new experiences and

information, by feedback from a variety of sources that encourage us to be more creative.

Today's overwhelmingly apathetic response to environmental issues is due to negative feedback. Fear of change and desire for comfort are creating a state of equilibrium rather than creativity, preventing a movement toward corporate solutions. But positive feedback is at work also: progress, no matter how small, at recent climate conferences and rallies; action groups mobilizing throughout the world; religious leaders and young people who are beginning to find their voice. This kind of feedback drives humanity into new ways of thinking, new ways of being, new ways of loving our Earth, and finally, new ways of experiencing the divine within matter. Today's global disasters seem to be driving humanity toward the edge of chaos, toward that point where creativity is enhanced and where motivation for radical action is acquired. The future depends on whether we have the courage to respond, whether we are willing to risk all without knowing exactly what will happen.

The Great Work

So many of us yearn to make at least a small individual contribution to the flourishing of our world, to contribute to a healthy environment, to care for the needs of the other, to put ourselves at the service of a greater consciousness. But today, the great work of creative union has become ever more challenging and requires the participation not only of each individual but also of the global village as a whole. As the peoples of our world interact with those from other parts of the globe and become more conscious of a larger reality, new blocks to unity need to be addressed. Becoming one is not easy; transformation is often painful. There is a price to pay. Union this deep requires a willingness to surrender all that we have and all that we are.

The pitch pine provides a striking example of the pain involved in transformation. This coniferous tree, which can readily survive forest fires, often grows in ecosystems where fires are prevalent. It is extremely sturdy, with a thick bark that protects the underlying cambium. However, its pine cones ordinarily remain closed long after the seeds have matured. The cones typically open to disperse the seeds only after exposure to very high temperatures, such as occur during a forest fire. The heat of a forest fire softens the resins that hold together the scales of the cone and scatters the seeds.

Sometimes, while immersed in fieldwork, chipping away at Earth's rocky layers, Teilhard experienced sudden fits of awareness of the laborious unification happening on planet Earth over the past 4.5 billion years. At those moments, he would become overwhelmed by a sense of the evolutionary processes still at work around him. He could intuit Earth acting and could sense the divine presence at its heart, drawing him forward. He identified this presence as the God

of evolution, the Cosmic Christ up ahead in the future, encouraging all creation to become more coherent, more intelligible, more united. The divine attractor who is ever seeking to hold all things within the divine grasp encouraged him to hope in the future, to expect novelty, and to believe that the world is becoming one. He vowed to work together with the God of evolution who is leading the way toward greater consciousness.

The Human Response

Given what we know about the dynamics of our evolving, chaotic, and unfinished world, will these insights motivate us to be truly creative and generative as Teilhard would suggest? Will they engender hope regarding our emerging future? Will knowledge of the increasing degradation of our environment encourage us to accept our responsibility to engage in the long-term and difficult work ahead? Will awareness of the damage done by our thoughtless actions as well as the effectiveness of our creative approaches to environmental problems lead us to more sustainable pathways?

The environmental crisis is a global one. Proposed solutions will involve and impact all peoples of the world. Therefore, conversations regarding future approaches must include all sectors of society. In 1995, the United Nations Earth Charter outlined fundamental values and principles needed by those who wish to build a just, sustainable, and peaceful global society. Since 1992, international climate change conferences called COP (Conference of the Parties) have been encouraging nations to limit greenhouse gases. Yet, many of the richer nations are reluctant to make significant changes.

Economic, political, and social organizations could play a key role in fostering the transformation to sustainability. Yet, they will not likely take up the challenge unless they are prodded by voters and consumers, spurred on by the people who use their services and are affected by their decisions. Global environmental organizations such as Eco Civ (Clayton and Schwartz 2019, 45–69) have been significantly impacting the policies of a few corporate and political organizations, helping them transition to what their proponents want. John B. Cobb Jr. defines an ecological civilization as a civilization whose "policies learn from nature and from nature's success in creating ecosystems that over time increase in complexity and richness" (Clayton and Schwartz 2019, 2). This kind of activity is sorely needed, since in the long run, progress will be made only when the larger culture changes.

The religions of the world could make a significant impact by uniting their members throughout the world around environmental issues. Some have taken helpful steps. Shortly before the recent climate conference, Pope Francis, Orthodox Patriarch Bartholomew, and Anglican Archbishop Justin Welby issued a joint statement urging broad commitment to the fight against the destruction

of our planet (McDaniel 2021). And the Jesuits have initiated a seven-year action platform (Jesuits n.d.) to implement the seven ecological goals found in Pope Francis's 2015 encyclical *Laudato Si'*. Their program, which involves not only Jesuit institutions but also many religious congregations throughout the world as well as all people of good will who wish to participate, aims to provide leverage for church members who are attempting to impact their congregations regarding environmental issues.

But, the local churches could do so much more with their congregations, especially by developing a deep empathy for polluted air and water, for denuded forests, and for endangered species, an empathy deep enough to counteract our compulsion to treat Earth's resources as consumer products. Without a deep connection to Earth, we tend to minimize its sacred nature and more easily abuse it. Celebrating rituals and liturgies that honor the beauty, immensity, and sacredness of Earth could more effectively touch hearts, heighten awareness and empathy, and, in the process, stimulate radical action that is both peaceful and loving. Imagining hopeful futures together would stimulate creativity, point us to new solutions, keep hope alive, and supply the energy needed to reverse the problem. On the other hand, frantic action without reflection about the complexities of the problem tends to encourage strategies that are ineffective and sometimes even drive people apart.

Many individuals continue to adopt practices that begin to turn the tide: cultivating awareness of their ecological footprint, recycling, reducing the use of natural resources such as fossil fuels. But individuals must also join with others who feel the problem deeply, with groups willing to exert pressure on government officers, corporate managers, and religious leaders to adopt policies and practices that have a positive impact on our environment, with organizations that can impact the prevailing culture. The goal here is not merely personal transformation, although that is a first step. What the world needs most is a communal transformation of consciousness.

Although it will take political, corporate, and technological effort and expertise as well as religious motivation to stem the tide of this climate crisis, significant change will happen only with the support of ordinary folks who, though perhaps already aware and concerned, are still addicted to consumerism and resistant to change of any kind, especially change that might affect comfort and convenience, lifestyle and economic status. In the face of the problems of our day, the individual can feel powerless, but in communion with others, people become more highly conscious and creative. Deepening our connection with the rest of the natural world and allowing that to affect our interaction with the environment will help us establish ever more effective networks with those who are willing to join the struggle. Teilhard (1959, 144) dreamed of the day when the whole of humanity would form "a single body and a single soul in love" and

would "choose to open its arms to call down and welcome the fire." Aware that we are part of the cosmos's amazing unfolding, each of us must become ever more conscious of our responsibility to engage its ongoing evolution.

As our world becomes gradually more complex, more coherent, and more intelligible, finding ways to put Teilhard's theory of creative union into practice is greatly needed. Like the protons that engage in fusion, like the molecules that form cells, like the starlings that swarm, we are each called to creative union: to treasure and care for the Earth of which we are a part, to forming ever-larger groups that could impact world governance, to engaging in ever more effective actions, to encourage union of person with person, of nation with nation, of humanity with Earth. Working together will enhance our innate creativity and reverse our feelings of powerlessness, allowing us to find new ways to move forward together. This puts relationships front and center—our relationship with God; with others, particularly those we might consider the outsider or the stranger; and, in our day more than ever, with our beloved Earth. The more we enhance our ability to establish loving connections with one another and with our Earth, the more we will be able to carry out the great work of creative union. Being conscious of Earth dynamics can inform choices.

Above all, we must keep hope alive—not a naïve optimism that refuses to look at stark realities but a hope based on our experience of Earth, of humanity, and of God. Despite Teilhard's experience on the front lines during all of World War I and his many struggles with church leaders, he continued to believe in the future and urge us to hope. His vision of promise can encourage us. As he says, "We have only to believe. And the more threatening and irreducible reality appears, the more firmly and desperately must we believe. Then, little by little, we shall see the universal horror unbend, and then smile upon us, and then take us in its more than Human arms" (Teilhard 1959, 137). Implementing this vision will require a commitment of all that we have and all that we are. But we can do it if we work together in love. My hope rests in our potential as conscious human beings to make a difference in our world. Our Earth is fruitful, humanity is good, and God is with us, ever urging us on.

Acknowledgments

This article derives from a presentation given in a session organized by the Institute on Religion in an Age of Science at the 2023 Parliament of the World's Religions, Chicago, IL, from August 14 to 18, 2023.

References

Clayton, Philip, and Wm. Andrew Schwartz. 2019. *What Is Ecological Civilization? Crisis, Hope, and the Future of the Planet*. Anoka, MN: Process Century Press.

Francis. 2015. *Laudato Si'*. Encyclical letter. Vatican City: Vatican Press. https://www.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html.

Gleick, James. 1987. *Chaos*. New York: Viking Penguin.

Jesuits. n.d. "Laudate Si' in Action." Jesuits.org. https://www.jesuits.org/our-work/justice-and-ecology/care-for-creation/lsap/.

McDaniel, Eric. 2021. "Pope Francis and Other Christian Leaders Are Calling for Bold Climate Action." *NPR*, September 10, 2021. https://www.npr.org/2021/09/10/1035653392/pope-francis-and-other-christian-leaders-are-calling-for-bold-climate-action.

Miller, Peter. 2010. *The Smart Swarm: How Understanding Flocks, Schools, and Colonies Can Make Us Better at Communicating, Decision Making, and Getting Things Done*. New York: Avery.

Teilhard de Chardin, Pierre. 1959. *The Divine Milieu: An Essay on the Interior Life*. New York: Harper & Row.

———. 1965. *The Making of a Mind: Letters from a Soldier Priest: 1914–1919*. New York: Harper & Row.

———. 1968a. *Science and Christ*. New York: Harper & Row.

———. 1968b. *Writings in Time of War*. New York: Harper & Row.

———. 1978. *The Heart of Matter*. New York: Harcourt.

———. 1999. *The Human Phenomenon*. Portland, OR: Sussex Academic Press.