Examining Our Past Relationship with Climate to Understand Climate's Current Importance: An Exploration of Climate Change During the Little Ice Age

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From the years 1300 until the 1850's people living in Western Europe battled a terrifying and seemingly insurmountable foe, the Little Ice Age. Examining how people of this time not only survived but thrived during an era of cataclysmic climate change can offer us positive perspectives and productive mechanisms going forward in our own battle with climate in modern times. Explored are massive famines and epidemic disease, volcanic eruptions and their after-effects, specific historical events such as the Black Plague and the Irish Potato famine and how all of these devastating events overlap to create a vivid picture of human fortitude. This article uncovers the tools and ingenuity Western Europeans employed to overcome a rapidly changing climate and how those tools are properly utilized to battle devastating climatic events. In exploring both scientific theory, including anthropological works such as Anthony Wallace's Revitalization Movement, and the modern church's position on climate change, this article hopes to address the current circumstance of global climate change and provide a potential way forward for modern humans in light of scientific reason and theological discussion about our unavoidable role in the environment.

1. Introduction

Our planet Earth has had a long and sometimes volatile relationship with its own climate; but what can be said specifically about earth's climate and how that relates to humanity's existence? Much has been expressed throughout written history of the relationship between people and climate. Many major natural catastrophes have been documented that led to the downfall of civilizations or the rise of new ones. However, natural disasters are just one potential aspect of climate change. What happens when the climate abruptly changes direction, and can these changes influence patterns of culture? In taking a closer look at one particular episode in recent human history, the Little Ice Age that occurred from 1300 AD until 1870 AD, could variances in climate have changed culture in such a way as to have affected economies, for instance, through forcing people to use different trade routes and migratory patterns as a result of encroaching glaciers and heightened occurrences of dangerous avalanches produced by increased snowfall and freezing temperatures? Could it also have changed other aspects of cultural such as religion? This paper will demonstrate that the climate change brought about by the Little Ice Age not only affected culture on the more obvious economic level, but more deeply at the level of people's belief systems.

Why study the Little Ice Age now? Because climate is a primary influence on not only how we do things, but also how we perceive them, that is, our culture. The relationship between these two things, climate and culture, creates a bridge between humanity and the world we live in, each influencing the other's development. They are so intricately linked that considering one without the other can be disastrous.

Also worth mentioning is religion's role in this connection between climate and culture. In Julian M. Murchison's book, *Ethnography Essentials: Designing, Conducting, and Presenting Your Research*, he asks that ethnographers take on the task of "identifying the unanswered questions in the literature." This comment recognizes the need to examine the omission of important theological considerations relating to climate change (Murchison 2010, 25). There have been efforts put forth to explain the issues of global climate change in terms of the ramifications it has on culture, but very few have taken seriously how these climatic events have

changed theology and our relationship with God. My hope in this work is to address these issues and help others to understand how culture and human activity are affected by global climatic events and change, but also how these events reshape religious belief, reform, and practice, as well as how we explain to ourselves how these events come to be, whether they are God ordained or hastened by human interference.

2. Historical Ethnography

I begin this look into human relationships with climate with an examination of the first Great Famine of the Little Ice Age that began as a deluge in the spring of 1315. From the Ural Mountains to Ireland the weather changed instantaneously and unpredictability, bringing with it the first great catastrophe of the Little Ice Age. So much rain fell for so long that "dykes were washed away, royal manors inundated. In central Europe, floods swept away entire villages, drowning hundreds at a time" (Fagan 2000, 29). The crops and animals did not fare well either; many were lost in the relentless rains that lasted through to August, creating a disastrous harvest and bringing military campaigns to a standstill. Louis X of France was halted from his campaign of invading Flanders when his "cavalry trotted into saturated plain, their horses sank into the ground up to their saddle girths. Wagons bogged down in the mire so deeply that even seven horses could not move them. Food ran short, so Louis X retreated ignominiously. The thankful Flemings wondered if the floods were a divine miracle . . . their thankfulness did not last long, for famine soon proved more deadly than the French" (31, 32).

Many hoped that 1316 would provide better weather and in turn more productive harvests, but unfortunately the rains continued. Crops turned to mush in their fields, those that could be planted. "Complained a Salzburg chronicler of 1316: 'There was such an inundation of waters that it seemed as though it was THE FLOOD.' Intense gales battered the Channel and North Sea. Storm-force winds piled huge sand dunes over a flourishing port at Kenfig near Pert Talbot in south Wales, causing its abandonment" (Fagan 2000, 38). Disease followed famine as people were already compromised from hunger. Many left their homes and villages in search of relief. Beggars roamed the countryside and crime rose from thievery and desperation. There was an uptick in piracy, and grave robbing increased as people became more desperate for food and money. Stories passed along described the horrors of starvation with people turning to unusual food sources such as dogs and dung, thus weakening their condition and hastening disease.

Records of crop failure are abundant from this time. The Bishop of Winchester's mill made no profit 'because the mill did not grind for half the year on account of the flood" (Fagan 2000, 40). France did not fare well either. Downy mildew attacked the grape crop and decimated its production. What little survived was recorded as harsh to taste. Germany's production suffered most of all, not seeing a good yield of wine again until 1328 (40).

Livestock suffered as well. When farmers ran out of hay reserves for their animals, they released them to fields to forage on their own and when the sudden cold snaps of 1317/18 occurred, many of the cattle froze to death in the fields. They were also susceptible to pernicious diseases such as rinderpest that resulted in intestinal failure as well as liver fluke: a parasitic worm that attacked sheep and goat flocks reducing them by well over half. Farmers were so dependent on their livestock they named this time as "the great dying of the beasts" which continued into the early 1320s and also impacted crop yields as fewer animals meant less acres plowed and less dung available for fertilization and to burn for heat (40).

Farmers were not the only ones suffering from the rains of the early 1300s; bakers augmented their loaves with whatever supplies they could find. "Sixteen Parisian bakers were caught putting hog dung and wine dregs in their loaves" (Fagan 2000, 41). People's diet relied so much on breads that bakers tried to satisfy the need with whatever materials they could find, causing illness, diarrhea, and dysentery. People became so desperate from hunger that they took to the fields to forage for any leftover remnants of cultivated or abandoned crops.

Those that survived the Great Famine were thankful, and the weather even seemed to improve. "The early fourteenth century was relatively prosperous. Some French historians refer to this period as the *monde plein*, 'the full world'," but this tranquil period of significantly better climate and crop production did not last long for "rats carrying fleas infected with a complex series of bacterial strains known as *Yersinia pestis*, which cause the bubonic (glandular) plague" were arriving from Central Asia (Fagan 2000, 81). The Black Death entered into Italy through its elaborate port system from Mongol traders spreading through the rest of Europe. The immune systems of the populations of peoples living in Europe were already compromised from malnutrition and other ailments associated with starvation from the Great Famine when the plague arrived. The cold weather also significantly increased the spread of the bubonic plague. Many people huddled together in front of the warm hearths of their homes to stay comfortable during the bitterly cold winters of the Little Ice Age, further spreading the plague through proximity, and the rats carrying the infected fleas joined them.

Original accounts from eyewitnesses during that time described in detail the horrible symptoms the victims of the plague faced. Indications of the bubonic plague consist of fever, chills, diarrhea, vomiting, shortening of breath, unbearable aches and pains, and eventually death. Some victims went to bed seemingly completely healthy but were dead by morning. The plague was also accompanied by strange large swellings. One first-hand account reinforces the plague's indiscriminate nature as well as its repulsiveness. The Italian poet Giovanni Boccaccio describes in his work, *The Decameron*, in detail the horror of the boils found on the victims of the plague.

Many proposed origins of the disease were considered; some believed all it took to transmit the plague was a firm stare from an afflicted person. But for the most part, people turned to religion, thinking that the plague was God's wrath for misdeeds and sinfulness. "In Germany, penitents stripped to the waist and beat their backs with weighted scourges, singing hymns in loud voices. 'They sang very mournful songs about nativity and the passion of Our Lord. The object of this penance was to put a stop to the mortality, for in that time . . . at least a third of all the people died'" (Fagan 2000, 82). In reality however, these penitents were sources of transmission for the plague. As they beat their backs, migrating from town to town, they carried with them the Black Death or at the very least, the fleas that transported the plague.

By the end of the first outbreak in 1351, it is estimated that over 25 million people had succumbed to the Black Death, one third of the population. There would be other outbreaks of plague throughout Europe for many more generations, but the first wave of the plague was the deadliest. In Paris, "the population fell by at least two-thirds between 1328 and 1470" (Fagan 2000, 82). In some parts of Normandy, the villagers suffered by the same numbers as in Paris.

During the Little Ice Age, plague and famine were not the only catastrophic climatic obstacles to humanity's survival; natural disasters in the form of volcanic eruptions also tormented them. Several destructive eruptions furthered tensions for the residents of Western Europe especially. The seventeenth century was dotted with eruptions that were inexorably linked to significant colder periods.

A large volcano in southern Peru, Huaynaputina, awoke from its slumber on February 16, 1600 and continued to erupt intermittently until March 5. "The scale of the Huaynaputina eruption rivaled the Krakatau explosion of 1883 and the Mount Pinatubo event in the Philippines in 1991. The volcano discharged at least 19.2 cubic kilometers of fine sediment into the upper atmosphere" (Fagan 2000, 104). Huaynaputina was a massive eruption, decimating fields, choking nearby cities with ash, collapsing structures, and killing at least 1,000 people along with thousands of cattle and sheep (Fagan 2000, 104).

What did Huaynaputina's eruption have to do with Western Europe or the Little Ice Age? Much, actually. Huaynaputina's eruption and consequential ash fall made the already chaotic climate activity worse. The sun, barely visible through the haze caused by fine particulates in the atmosphere from the eruption, was unable to significantly heat the Earth, making the summer of 1601 the coldest since the 1400's for the northern hemisphere. "Summer sunlight was so dim in Iceland that there were no shadows. In central Europe, sun and moon were 'reddish, faint, and lacked brilliance" (Fagan 2000, 105).

In 1641, another explosion occurred when "Mount Parker on Mindanao in the Philippines erupted with a noise 'like musketry.' Wrote an anonymous Spanish eyewitness; 'By noon we saw a great darkness approaching from the south which gradually spread over the entire hemisphere" and they began to fear "in the darkness 'the Judgement Day to be at hand'" (Fagan 2000, 105). Again, as with the Huaynaputina eruption, the Mount Parker eruption dropped temperatures not just in the areas surrounding the Philippines, but globally.

Volcanic eruptions continued to occur creating colder winters and shortening growing seasons affecting harvests and increasing the risk of famine, food dearth, and bread riots. Some scientists believe these increased volcanic eruptions were the main cause of the Little Ice Age. The largest eruption to occur during the Little Ice Age with the most catastrophic of consequences was the Mount Tambora eruption that took place in 1815 in Indonesia. A once dormant volcano sprang to life and created one of the most cataclysmic events known to modern history. Rumblings began on April 5, 1815 and finally on the 11th Mount Tambora erupted. The inhabitants of the island, as well as those of the neighboring islands, died as a result of the initial explosion or very soon afterwards from the aftermath. First-hand accounts from British officers on the island show that they suspected the rumblings and later explosion to be the work of another military force declaring war on the British occupied island of Java, or of marauding pirates.

To understand the full devastation caused by the initial eruption and to give it an accurate depiction and comparison to other volcanic eruptions, I have included a full paragraph from Brian Fagan's work:

> Volcanologists have fixed the dates of more than 5,560 eruptions since the last Ice Age. Mount Tambora is among the most powerful of them all, greater even than the Santorini eruptions of 1450 B.C. [which wiped out the Minoan civilization on the island and sunk the caldera completely]. The ash

> discharge was one hundred times that of Mount Saint Helens in Washington State in 1980 and exceeded Krakatau in 1883. Krakatau, the first major eruption to be studied at all systematically, is known to have reduced direct sunlight over much of the world by 15 to 20 percent. The much larger Tambora event, coming during a decade of remarkable volcanic activity, had even more drastic effects at a time when global temperatures were already lower than today. (Fagan 2000, 169)

The initial explosion was felt throughout the region, but the volcano was not yet exhausted, on "April 19, the explosions resumed, this time so intense that they shook both houses and ships" (Fagan 2000, 167). Precipitation in the form of ash, cinders, and other fine particulates fell for days blocking out the sun and choking the island's inhabitants. Much like the eruption that afflicted Pompeii after the eruption of Mount Vesuvius, pyroclastic deposit buried thousands. Mount Tambora continued to erupt for three more months with even more disastrous consequences. Alan Robock, Professor of Climatology at Rutgers University, states that "large volcanic eruptions inject sulfur gases into the stratosphere, which convert to sulfate aerosols with an e-folding residence time of about 1 year. Large ash particles fall out much quicker. The radiative and chemical effects of this aerosol cloud produce responses in the climate system. By scattering some solar radiation back to space, the aerosols cool the surface, but by absorbing both solar and terrestrial radiation", and he further concluded that, "volcanic effects played a large role in interdecadal climate change of the Little Ice Age" (Robock 2000, 191).

"From Teramo in central Italy, near the Adriatic coast, came reports in late December 1815 of 'the heaviest snow ever known in that country.' More astonishing was the nature of the precipitation. The snow 'was of a red and yellow color . . . [which] excited great fear and apprehension in the people" (Klingaman and Klingaman 2013, 17). A few weeks after the bizarre snow in Italy, Hungary met with a powerful snowstorm dropping several feet of snow reported as oddly colored as described by an observer: "despite the magnitude of the storm, news accounts focused primarily on the fact that 'the snow was not white, but brown or flesh colored" (18). Italy again received peculiarly colored snow, but this time in the Alps "around the Tonale Pass, 'it was brick red and left an earthy powder, very light and impalpable, unctuous to the touch . . . [with an] astringent taste" (18). All of these bizarre colorations of snow were a direct result of Mount Tambora's eruption. Those sulfur dioxide gas particles mixing with water vapor in the atmosphere to produce droplets that froze to become snow were colored from the fine particulates of the eruption. And, as we have seen, "the spreading aerosol cloud from Mount Tambora had been cooling global temperatures by reflecting and scattering sunlight. It reduced the Northern Hemisphere average temperature in 1816 by about three degrees Fahrenheit" (19).

In 1816 the full effects of Tambora's massive series of eruptions started to make their way to Europe, causing not just cycles of bizarrely colored snow events but recurrent crop failure and further exacerbating famine and malnutrition, as well as a devastatingly grim cycle of frigid temperatures and bad weather in which there was a 'year without a summer'. Heavy rain soaked the fields of Europe because of the increased cloud cover brought about by the eruption. Storms became stronger and more intense, loaded with hail; they indiscriminately battered the lands as well as the people, animals, and structures of both cities and rural villages. The harvest yet again failed and "soon drove cereal and bread prices beyond families' reach. English wheat yields in 1816 were the lowest between 1815 and 1857, at a time when food and drink consumed two-thirds of a laboring family's budget" (Fagan 2000, 171). French citizens suffered as well. Their crop yields were half what they would normally glean and in some areas their grapes did not ripen at all on the vine resulting in low production of wine. Luckily both regions, England and France, legislated "politically mandated subsidies to keep bread prices low" resulting in food dearth, instead of famine (171).

As is the case with most famines, disease followed. Typhus and fever epidemics assaulted the already compromised and malnourished residents of Europe. Typhus passed from person to person through the infection of body lice feces. Many huddled together during the brutally cold years after the Mount Tambora eruption and passed typhus between them at an outstanding rate. "The desiccated and infected fecal dust clung to woolen fabrics such as cloaks and blankets, which were often the only source of warmth for people. In 1817/18, 850,000 people in Ireland were infected by the epidemic" with over a 100,000 succumbing to it (Fagan 2000, 178).

Famine, plague, and volcanic activity all had significant impact on Western Europe during the time of the Little Ice Age, but one very unfortunate series of events, mostly occurring in Ireland, almost crushed a civilization. Since the introduction of the potato as a successful crop in Ireland in the late 1600's, the people of Ireland soon began to rely on it as their primary source of food and revenue. The introduction of the potato to Ireland's crop rotation actually bore some fruitful years for the nation, and growing potatoes became a prosperous endeavor for many farmers. The potato did well in the rocky soil and wet climate of Ireland; often resistant to short growing periods, enduring floods or seasons of drought, and took very

little effort to cultivate, cook and store. Unfortunately, because potato cultivation was so advantageous, Ireland replaced much of its other crops with it and dangerously became an almost entirely monoculture society. Unknowingly this set up the residents of Ireland for nearly complete ruin. How would they know that a vegetable brought back from the Andes and cultivated with such great success in their own backyards would almost completely collapse their nation? While cereal crops used to supplement their diet failed because of poor conditions brought about by the cruel Little Ice Age's climatic shifts, the potato remained resilient. This did create some smaller food dearths, but the understanding and empathetic Irish government acted quickly to resolve the issue so people would not go hungry for long. However, in the year 1800, a move towards unification joined England and Ireland, and the newly governing administration was unsympathetic to food dearth, while openly accepting the bountiful revenue from the Irish potato. In the year without a summer, "more than 65,000 people died of hunger and related diseases because the British authorities chose not to ban grain exports, an effective measure in earlier dearths" (Fagan 2000, 187). In June of 1817, then Chief Secretary Robert Peel issued a proclamation in relation to these food dearths in Ireland stating, "persons in the higher spheres of life should discontinue the use of potatoes in their families and reduce the allowance of oats to their horses" (187). To say the Irish met the announcement with resentment would be an understatement.

Ireland had many successful years cultivating their crops of potatoes, even if their production did not entirely prevent food dearths. But one fatal mistake was made in the early 1800's that led them down a dark path of ruin, starvation, and desperation. Many species of potatoes had found their way to Ireland and several varieties were highly prosperous. But one in particular was favored over the others for consumption by the Irish, not necessarily because of its pleasant taste or nutritional value, but because it was a quick grower in bad conditions. The variety of potato, named the Lumper, was the one the poor of Ireland selected to grow for themselves. They exported all their other varieties. But because of their poor quality, this variety of potato would not store until the next year. Lumpers provided no cushion between one year's crop failure to the next, so the ensuing potato blight was indescribably devastating and left most of Ireland completely vulnerable.

Irish people began to migrate to America long before the Irish Potato Famine began because of overcrowding and the overutilization of what land was available for farming. "'The condition of Ireland becomes worse and worse,' wrote John Wiggins in *The Monster Misery of Ireland,* published in 1844. Ireland was 'a house built upon sand . . . and must inevitably fall the moment that the winds blow and the waves rage, or even with the first and slightest gale" (Fagan 2000, 188). Little did Wiggins know just how prophetic his words would be, for the seed of a tragedy was growing in the form of a blight caused by a tiny fungal organism brought from across the Atlantic. The specific potato blight to bring ruin, known today as *Phytophthora infestans,* causes the potato to first develop black spots, then furry growth, then finally to rot completely. The wicked winds common during the Little Ice Age helped to spread the infectious spores throughout Europe. The Lumper, Ireland's preferred variety, was especially susceptible to disease, and the blight made quick work of thousands of acres of crops. By October 1845, the blight had completely overtaken Ireland's potato crop and rotted them in their fields. "The mean loss from tuber rot in Ireland in 1845 was about 40 percent and the threat of famine immediate. In London, Prime Minister Sir Robert Peel responded to the reports of crop failure by appointing a Scientific Commission to diagnose the problem, report on the extent of the damage, and recommend an antidote" (190). The Commission came back so very much alarmed by what they had observed, that immediate action was recommended. However, "Peel ordered for the immediate importation of £100,000-worth of maize from the United States. Peel intended this measure not as a way of feeding the starving potato farmer but as a way of controlling grain prices cheaply, without any danger of the government being accused of interfering in the cereal marketplace" (190). The following year, the blight reoccurred but earlier than the previous year. By August, almost every potato was a total loss. "On September 2, the London Times called the potato crop a 'total annihilation" (191). England continued its vulgar and abusive export of Irish grains, knowing of the unmitigated failure of the potato crop, and leaving the Irish with very little to survive upon. England even went so far as to send troops to protect the wagonloads of cereal crops for export from the hungry masses. Children and the elderly began to die first, and then in October "the North Atlantic Oscillation [NOA] flipped into low mode, bringing the most severe winter in living memory" (192). Many began to die from exposure to the elements. Captain Wynne recorded his account of the suffering at Clare Abbey "witnessed more especially among the women and little children, crowds of which were to be seen scattered over the turnip fields like a flock of famished crows, devouring the raw turnips, mothers half naked, shivering in the snow and sleet, uttering exclamations of despair, while their children were screaming with hunger" (192). Another witness to this terror, Magistrate Nicholas Cummins of Cork, when visiting Skibbereen reported that:

> six famished and ghastly skeletons, to all appearances dead . . . huddled in a corner on some filthy straw, their sole covering what seemed to be a ragged horsecloth, their wretched legs hanging about, naked above the knees. I approached with horror, and found by a low moaning they were alive—they were in fever, four children, a woman and what had once been a man. (Fagan 2000, 192)

Disease swept through Ireland's emaciated population. Hospitals were overrun with patients, dead or dying from starvation, disease, or hopelessness. The British government sent supplies for tent hospitals to be raised but people still died on the ground. By 1847, the weather improved and the harvest was bountiful, but because so many had eaten their seed potatoes out of desperation and were debilitated from disease and starvation, less than a quarter of the normal farmland was cultivated. England watched on. Many of England's Ministers "believed that poverty was a self-imposed condition, so the poor could fend for themselves." This was a time of free market and the beginning of capitalist ideals, after all (193). In 1848, people had renewed hope that the blight had been abated and replanted everywhere they were able. Early spring finally afforded them favorable weather, but by July the blight was back almost overnight, rotting everything in its wake. People defaulted on their rents and their landlords evicted them, many still could not afford food for their families, so thousands left Ireland to come to America to start again. Thousands of acres of land were abandoned and unworked and people took to living in ditches or wherever they could find to rest for free. The hopeless and despondent began to commit crimes just to end up in jails or crowded workhouses.

The Irish named the Great Potato Famine, *An Ghorta Mór*, which means the great hunger, and conservative losses are estimated around two and a half million due to starvation, disease, or immigration. "The 1841 census records 8,175,124 people living in Ireland. In 1851, the number had fallen to 6,552,385. The Census Commissioners of the day calculated that, with normal rate of increase, the total should have been just over 9 million" (Fagan 2000, 194). Ireland was forever changed. Immigration still rose sharply even after years of famine and disease abated. Finally, the blight was successfully eradicated by 1851, but because of the trauma endured during the years of the Irish Potato Famine mental illness in Ireland became prevalent. The relationship between Ireland and England was damaged and troubled for many years after the blight had gone. The Irish did not forget so easily the ill treatment they had received from the English at the end of the Little Ice Age.

3. Anthropological Implications

A. R. Radcliffe-Brown in his work, *Structure and Function in Primitive Society*, introduced the theoretical concept of a systematic framework of concepts and generalizations relating to the social structure of societies, termed structural functionalism. Radcliffe-Brown believed that social systems are integrated mechanisms in which all parts function together to bring about unity in the whole. Structural functionalism was "the process of social life." He states, "the process itself consists of an immense multitude of actions and interactions of human beings, acting as individuals or in combinations or groups" (Radcliffe-Brown 1965, 4). Understanding this process can be especially helpful when applied to the relationship between humanity and environment. There is undoubtedly a connection between people and their own environment as well as that particular environment's climate. Humans react to stimuli from the environment by constructing social and cultural processes to deal with their situations, even if tacitly, and to ignore the impact of these processes would be to miss the significance of culture or society as a whole. For the people of the Little Ice Age, their actions and interactions with their environment allowed them to succeed even when faced with starvation, complete crop failure, threat of violent storm or encroaching glaciers, and even the occasional volcanic eruption. They experienced all of these events, processed and reassessed their situations, and adapted. To relegate the environmental factors as mere background to the human experience is to dismiss the structural functional whole.

To look a little closer at this idea of structural functionalism as presented by Radcliff-Brown, we must immerse ourselves in the time of the people living during the Little Ice Age. This is not easy to do, but it can be accomplished through the utilization of narrative language and first hand accounts, as seen above in Fagan's work. The Little Ice Age tested the limits of peoples in Western Europe, many of whom where subsistence farmers barely making enough in foodstuffs to survive from year to year. They were closely connected to the land, and when the climate abruptly began to cool or produce periods of significant drought or flood, they felt the implications immediately. This close connection to land and climate of those living in Western Europe at the time of the Little Ice Age is an interesting phenomenon, one that has been previously been explained through the use of the theory of environmental determinism.

Environmental determinism is a theory that has much to contribute to our understanding of the relationship between climate and culture. This theory presupposes that the physical environment necessitates

certain predetermined adaptations in regards to the cultural development of the groups inhabiting the area. Environmental determinism seeks to explain why certain cultures develop as they do in response to the environment in which the culture is set, and to consider important aspects of cultural survival such as availability of important resources providing food, shelter, and comfort. However, this concept does not explain the relationship between social conditions and cultural change; it merely relies on physical aspects of the environment as causal factors.

Brian Fagan explains his adherence to environmental determinism, saying, "human relationships to the natural environment and short-term climate change have always been in a complex state of flux. To ignore them is to neglect one of the dynamic backdrops of the human experience" (Fagan 2000, xv). One cannot look at the implications of the Great Famine, the Black Death, the year without a summer, or the Irish Potato Famine and not recognize how climate changed culture. None of these events would have been solely responsible for the collapse of any one civilization. However, they did have an immediate impact on them, and through adaptation, alteration, and innovation Europeans survived each despite the chaotic climate of the Little Ice Age.

Environmental determinism is just one explanation of this unique relationship between climate and culture. Another explanation is found in ecological anthropology. This particular sub-discipline focuses on the intricate connections between human groups and the environment in which they reside. Ecological studies of the connections between climate and culture by anthropologists have come from notable researchers in the field such as Margaret Mead and E. E. Evans-Pritchard, who looked specifically at subsistence practices of local communities and societies as well as how individuals process natural disasters. "New studies ask how coping ability is affected by the dynamics of the wider society and, further, the role society plays in determining who does or does not become a disaster victim in the first place" (Dove 2014, 2). Ecological anthropology can be just as relevant in looking at historical human responses as current reactions. The period known as the Little Ice Age was rife with natural disasters, and the unpredictable climate thrust people into a battle of wills pitting nature against humanity for survival. Dove comments that anthropology has recently been able to look at climate change from the position of "being there and the capacity to provide insight into perceptions, knowledge, valuation, and response," but that some social sciences are still debating the necessity for studying and researching climate change in relation to human culture (3).

To understand more profoundly the fundamental relationship between climate and culture, an examination of Anthony F. C. Wallace's work is in order. Wallace, an acclaimed cultural anthropologist, presented a theory in a work published in the *American Anthropologist* in April of 1956 that is relevant to this subject. He presents a new concept, the *revitalization movement,* to explain the process of individual stress becoming societal stress, which in turn produces a paradigm shift so significant that in areas of religion especially, movements develop into new denominations or even result in religious revolution (Wallace 1956, 265). Wallace defined a revitalization movement as, "a deliberate, organized, conscious effort by members of a society to construct a more satisfying culture . . . from a cultural standpoint, [it] is a special kind of culture change phenomenon: the persons involved in the process . . . must feel that this cultural system is unsatisfactory; and they must innovate not merely discrete items, but a new cultural system" (265). He explained that previously cultural shifts were thought to be gradual and provided a chain reaction of sorts as the result of environmental or individual stress. To the contrary, Wallace claimed that change can happen "abruptly and simultaneously," and he cited Margaret Mead who said, "cultures can change within one generation" (265). Wallace continues that "revitalization movements are evidently not unusual phenomena, but are recurrent features in human history" (267).

To explain the process of what occurs during revitalization movements, Wallace begins by explaining that localized stress can be a primary motivator for cultural change because the localized stress soon becomes too great for the individual to bear alone, and they then challenge the current "steady state" so that the stress can be more easily managed. (Wallace 1965, 268). Once social stress has passed tolerable limits for the individual there begins a "period of cultural distortion" where individuals either choose to address the stress and adapt to changes in their cultural behavior or to tolerate the stress, potentially developing unhealthy coping mechanisms that ultimately create "disillusionment and apathy toward problems of adaptation" (269, 270). The next stage in this process of social and religious change is a "period of revitalization" (270). This stage is led by a prophet or charismatic leader who facilitates social change and is chosen through supernatural appointment. Historically these leaders have been government officials, scientists, religious leaders, researchers, and inventors. These prophetic leaders offer their followers a different version of social reality wherein different thoughts, ideals, and even technologies are presented and utilized. Interestingly, Wallace shows a split in the way forward for these charismatic leaders and their followers, "prophets do not lose their sense of personal identity but psychotics tend to become the object of

their spiritual longing" (272). So leaders lead their followers through new cultural shifts providing for an elimination of perceived stress. When a prophet begins the process, it creates a new steady state wherein the "cultural transformation has been accomplished and the new cultural system has proved itself viable" (275). Conversely, when a psychotic begins the process, the social structure erodes and the leader becomes the center of their own created world whether through delusional fantasy or narcissism. Eventually the cultural deterioration of the group is so significant that the society perishes. These ideas can be further substantiated by an examination of several cult-like groups throughout the world, including the notorious Manson family and Jonestown, created by Jim Jones.

We can apply the concept of the revitalization movement to the enormous paradigm shifts that occurred during the Enlightenment and the Industrial Revolution, both of which occurred during the Little Ice Age. The Scientific Revolution, which preceded the Enlightenment, addressed a social need for scientific explanation during a time of increased anthropo-centrism. Many people in Europe lacked sufficient education or knowledge to further themselves in their position or status as society was emerging from medievalism. But others became "self-made men" who rose in status and intellect. The Enlightenment provided for the development of new ideals, specifically the separation of church and state, the idea of liberty, and the new forms of government not based on monarchy. These new ideals were born out of social stress experienced by those unwillingness to continue the cycle of servitude and in need of support for their new independence.

The Industrial Revolution created a working class, further facilitating the transition from a population of mostly subsistence farmers and serfs to that of factory workers, machinists, and other new industrial jobs. Modern technologies were also created using the newly developed steam powered engines, harnessing of electrical power, and the invention of the assembly line. These people too needed new ideals and encouragement, much of which came from religion (as I will describe below).

In sum, the cultural adaptions that occurred during the Little Ice Age are but a small example of how resilient the human spirit can be, even when faced with insurmountable and unexplainable odds. There were specific cultural changes in reference to daily matters such as farming techniques, but also with heating concerns and fire safety, as well as advances in medicine and hospital care. Additionally, inventions were created to make life more productive, but more enjoyable and comfortable as well. People during the Little Ice Age in Western Europe chose not just to survive at a time of erratic and often times unpredictable climate change, but to find ways to embrace their struggles in the changing climate and to elevate those experiences. There were large-scale revolutions in social thought and religious theory made during this time as well, that forever changed how Western Europeans related to their environment and each other.

4. Theological Considerations

The Little Ice Age was rife with complex weather events, social and economic adaptations, rebellion and war. Climate most definitely affected culture, but was religion changed as well? Were the stresses that people faced in their day-to-day lives placated by faith or did the complications and corruption that existed within the Church help to exacerbate these issues?

The Roman Catholic Church during the beginning of the Little Ice Age was a colossal powerhouse of Christian thought and influence, but with that power came corruption. Before the Little Ice Age, during the Medieval Warming Period, the Church had seen significant growth not just in land acquisition but also with the successful influence of rulers and gentry. The pockets of the Church seemed limitless. But as a result of the first few years of devastating climate change during the Little Ice Age an increase in abuses by the Church began. Somehow the Church needed to maintain their revenues amidst all of the strife and stress the peasants and then later the nobility were facing: enter the idea of indulgences. The Roman Catholic Church implemented the use of indulgences to continue to fund their very expensive building projects and control of the ruling class. This process of absolution through payment reduced the punishment and time spent atoning for sins, but created major issues for the peasant class which could not afford to pay these costly absolutions, especially when they could not even afford to pay for food or supplies to keep their own homes running sufficiently. Under the weight of significant stress, they soon looked to an individual that would provide a way forward through a revitalization of the church in doctrine and practice. Martin Luther acknowledged the coercion, force, and abuse by the leaders of the church that he believed to be an exploitation of the church's power and influence. He began to construct a way for Christian believers to continue their faith, but without the costly penance of indulgences (among other things).

Anthony Wallace would have described Martin Luther as a prophet, given his role in religious revitalization. Luther raised theological questions about free will, the sacraments, the division of church and state, and of the authority of the rulers. Luther's theology was intense and multifaceted, and it challenged the corruptions and coercion of the Church. His ideals instigated a reform in the Church and of its practices.

The stress people felt during this time of corruption and abuse must have been tremendous. The poor could not afford to pay their loved ones' way out of purgatory so they believed they would forever languish there. Luther's answer to indulgences was the understanding that grace and absolution can only come from God and are free.

John Wesley was another monumental religious figure responsible for reform during the time of the Little Ice Age. Wesley had a passion to bring the gospel to the people, and circumvented the restrictions and structures of the Anglican Church to do so. He understood that only certain portions of the population of England were able to attend services. Most had to keep working through the week and were unable to leave their fields long enough to make the journey to church for service. To meet their needs, Wesley "covered nearly a quarter of a million miles in his lifetime, delivered forty thousand sermons and yet found time to write well over two hundred books" (Wood 1978, 116). "Heat and cold, rain and wind, hail and snow, bogs and floods did not prevent him from bringing the message of life and light to the people who walked in darkness," all of which were more severe due to the unpredictable weather of the Little Ice Age (117). Wesley understood that "his real pulpit was where the people were. His was essentially an outgoing ministry to take the gospel, as the Savior did, to the man and woman on the street" (136). Thus Wesley broke with traditional preaching and brought the Word of God to the people, more effectively conveying God's message of love and forgiveness to others and presenting complex theological ideas in a common tongue.

One important theological development relevant to the Little Ice Age was John Wesley's interpretation of prevenient grace and how that was available to all who believed in God through God's divine love for us. Wallace would point out that this new development in theology would create a paradigm shift in normal accepted theological theory and doctrine of the time. He would also consider that the understanding of prevenient grace would allow for the stress the individuals were feeling in regards to the Anglican Church and its archaic traditions to be placated. He was able to explain how prevenient grace begins the cycle that leads to sanctification, which is the ultimate goal of every Christian and is rewarded by entrance into Heaven. Wesley saw many converts to Christianity and witnessed many be saved during his long career as an itinerate street preacher. He witnessed that "the habitual drunkard, that was, is now temperate in all things" (Placher and Nelson 2013, 212). Wesley became someone that Wallace would regard as a prophet; a supernaturally ordained individual, hand-picked to liberate individuals and society as a whole from the rising stress of their difficult lives. In Wallace's terms, Wesley delivered them from a period of cultural distortion to a new stable state where individuals could yet again maintain their stress at appropriate levels.

These are examples of specific religious events that produced societal paradigms shifts of great importance to the people of the Little Ice Age. When people are scared, stressed, disillusioned, or troubled, they turn to their religious foundations to shore up their lives. Faith gets people through many hardships in life. One of the most stressful climatic events in modern history was the Little Ice Age. Livelihoods were challenged on a monthly, weekly, or even daily basis. People turned to their faith to get them through. The otherworldly climatic events that occurred between the 1300's to the mid-1800's confronted people with adversity. Our modern understanding of weather patterns, cold fronts, glacial encroachment, volcanic eruption and the consequences of all of these events was not something the people of this time could explain; they believed they were supernatural in causation. Many believed God to be unequivocally in control. They found hope through faith and eternal life through salvation that went beyond their earthly fears of changing weather patterns and cool sunless summers that furthered fears of hunger, famine, and disease.

It is apparent with the rising concern about global warming and climate change, that Christianity is in the throes of yet another paradigm shift. A shift wherein we again concern ourselves with the care of God's creation and the understand that we exist within its perimeters instead of above or disconnected from them.

Long before the modern age, in the sixteenth century, Martin Luther understood both the majesty and intricacies found within God's creation when he exclaimed, "If you truly understood a grain of wheat, you would die of wonder" (Huyssteen 2003, 248). He as well as Calvin and Wesley, among so many others, set the groundwork for an understanding of the delicacy and grandeur found in the environment. Luther understood that humans are to be cultivators and stewards, not exploiters, of creation. He also understood the nearness of God in the environment as Huyssteen illustrates in saying, "God was not detached from the world, far above in some spiritualized heaven. On the contrary, as Luther often said, God is 'in, with, and under' the whole created world" (248). These great theological minds understood and appreciated the complexities of the world affected by the Little Ice Age and all its chaotic and dramatic climatic swings.

In our time, A. J. Swoboda in the introduction to *Blood Cries Out: Pentecostals, Ecology, and the Groans of Creation* (2014), suggests that, as Christians, we not only need to encourage a sense of environmental awareness, but to elicit a call to action to achieve justice specifically with the environment in mind.

> Any postmodern, postChristian, intellectually-privileged, secular individual who has rejected the claims of the Bible will at some level believe in and practice their own sense of justice in their world. Admittedly, that sense of justice may not be rooted in any way to Christian theology or Scripture. But one quickly becomes aware that nearly every non-religious Western individual believes wholeheartedly in justice and absolute truth the minute the words "bullying", "rape", "subordination", or "Monsanto" are spoken. Everyone has a sense of justice—religious or not. (Swoboda 2014, xiii)

Swoboda suggests that in essence the "Spirit of Pentecostalism" is that sense of justice and healing that needs to take place in the world, not only between people, but also between humanity and God's creation (xvii). Forgiveness and grace are two of the core components in Christianity and without humanity doing our part to enact change environmentally, not only will creation suffer, but justice will not be done. Ultimately our eternal fate is at stake. We need to understand again the value found within God's creation, not just to resist our temptation to domination, but also to appreciate the beauty and wonder of it all. Svoboda suggests that we need to stop resisting and denying our culpability in the process of the deterioration of God's creation "and respond afresh . . . that it *is* we who are tasked as keepers of God's garden. And it is by the Spirit we stop passing the buck to the next generation" (xvii).

Veli-Matti Kärkkäinen discusses how "religions' voice is widely dismissed in public conversations concerning the care of environment" because we are continually blamed for its current condition due to the perceived anthropocentrism of Christianity. (Kärkkäinen 2014, 84) But, says Kärkkäinen, this condemnation of Christianity and its abuse of creation is due to a misuse of scripture has been clarified and rectified by the work of Paul Tillich and Joseph Sittler. Kärkkäinen adds, "Christian theology should have reminded itself more often that the mandate in Genesis 1:26-27 for humanity to act as God's faithful vice-regents does not justify abuse but rather is a call to responsible service on behalf of God's good creation" (86). Unfortunately, the ever-present myth remains of the separation of the worldly and the sacred in the West. Enlightenment ideals of this separation still plague the West. However, when looking at Christian tradition and the leaders of that tradition historically, we see exemplified a specific relationship with the Earth that both honors and respects God's creation. One such example is St. Francis of Assisi and his uninhibited love for the entire living world.

Kärkkäinen says that in the "Judeo-Christian tradition the human being is placed in the world as steward, accountable to God. Rather than superiority, humanity should exhibit solidarity with creation to which it also belongs" (87). He then emphasizes that Jesus was resurrected not just for humanity, but also for all of God's creation, for every living thing. Kärkkäinen returns at the end of his chapter to reassert religion's voice in the conversation by stating,

> A continuing dialogue with natural sciences is a necessary task and asset in this pursuit. Although theology should never be merely the recipient of science's ever-new insights—the dialogue is rather a two-way process in which both parties speak to and challenge each other—no credible theology of creation and ecology can be constructed currently without deep investigation of scientific resource. (Kärkkäinen 2014, 94)

Peter Althouse introduces the term *creation care* into the discussion as a "transformational eschatological ethic inlud[ing] personal, social and global responsibilities" (2014, 123-124). Althouse even believes that Darwin's evolutionary theory can work in union with Moltmann's understanding of the idea of tripartite creation, for as he explains, "what evolution reveals is that humans are not 'godlike' and set apart from the rest of creation, but one species among the whole community of biodiversity in the planet" (125). Althouse understands how important it is for humanity to step up, take responsibility of our past abusive relationship with creation, and begin a new relationship of genuine stewardship. He also describes this past relationship as violent and sinful because those that have been baptized by the Spirit should honor God's creation instead of squandering it. By exploiting creation and humankind, we have also exploited the Spirit, so we need to understand the importance of correcting our relationship with creation. For as Althouse explains,

> the infilling of the Spirit is a kenotic act that makes the Spirit present in the world and in creation. It harkens back to the kenosis of creation when the Spirit's presence fills the earth with life. The Spirit is poured out on all flesh. Moreover, the kenosis of Spirit that manifests the Spirit's presences in creation also anticipates the cosmic realities of the new creation where the goal of Spirit kenosis is the delimitation of God who will be fully present with and in the renewed creation. (Althouse 2014, 127)

Althouse approves of Moltmann's transition from an anthropocentric view of ecotheology to one of a biocentric view, centering nature instead of humankind. This change in perspective allows individuals to understand the importance of creation and how we are just one facet of the whole of the cosmos. Ultimately,

Althouse's answer to the burgeoning global and climatic crisis is the individual response. He aligns again with Moltmann and suggests, "the accumulation of personal choices had global ecological consequences. Moltmann therefore proposes the adoption of a simple lifestyle of moderation and cultural solidarity. Living an ecological lifestyle means a return to embodied existence and a global ecological consciousness with local lifestyle choices" (129).

In looking at individual responses, we can see the transitions taking place from archaic Westernized anthropocentric ideals of control and dominance, as well as the erroneous disconnect between humans and other animals, to one of a more conscientious model of creation care and ecotheology wherein God is recentered. But what of the denominational view? Have some denominations offered a plan of action going forward as we observe significant increasing stress on creation and humanity?

Specifically, the United Methodist Church has made a call to its members and others to be more mindful of our impact on the Earth and ways in which we can hold ourselves more accountable for our actions. In Ryan Dunn's article, he confesses that, "I engage in behaviors that I know detract from the goodness of the natural world. The harm I—and many others—do to creation has real effects" (Dunn 2019). Dunn goes on to identify the many factors that contribute to the deterioration of the environment, from noxious emissions to the poisoning of our oceans and waterways with loads of garbage and plastics, to the severely detrimental practice of deforestation that is not only advancing soil erosion but also depleting habitats for native flora and fauna. He makes an interesting connection between witnessing the goodness of God in creation and being intentional in our relationship to the Earth and others. He suggests that if we neglect our relationship with and stewardship of God's creation, we are also neglecting our relationships with others who were created in God's image. Dunn reminds us that, "the poorer a person is, the more likely environmental degradation will deliver negative effects. The fewer resources available to a person, the more likely she experiences hardship from environmentally-influenced asthmas or cancer. The impact of environmental disaster deepens in accordance with poverty" (2019).

Our current predicament with the planet and its climate is escalading at an exponential rate and only time will tell what the outcome of our efforts going forward will be. Are we headed towards another global crisis of global warming or are we about to enter into another Ice Age, potentially much like the one experienced in the years from the 1300's until the 1850's? While I have an opinion on the subject, it is not based on my own professional acumen nor my own research. Instead, I prefer to consider climatologists, meteorologists, and weather historians' opinions, which do vary considerably. In any case, one premise is true, God has created the whole world for us and we are called to care for it and nurture it to the best of our abilities. If we fail to understand the significance of the relationship between our home, and ourselves, we have not only failed ourselves, but we have failed our covenant with God.

> Our conviction is that time is limited for engaging the predicament in which our planet is immersed, that we cannot flee the "inescapable," and that God has situated us in this place "for such a time as this" (Esther 4:14). In memory and honor of those who have gone before us, and in love for creation and for those inexorably affected by our decisions, both now and in the future, the time has come for Christ-followers to "re-vision" their history, study reflectively, think imaginatively, pray humbly, and act boldly. (Brunner, Butler, and Swoboda 2014, 94)

4. Conclusion

One observation I have made in this study of the Little Ice Age is that humans are ultimately highly adaptive. We have learned and advanced in ways never thought possible. We are an ingenious species, ever adaptive, ever triumphant. We are resourceful and industrious and will take on any challenge in an effort to see our species grow and thrive. The people of the Little Ice Age met with seemingly insurmountable odds, but adapted their methods, their culture, their societies, and even their religious beliefs to withstand the challenges of bitterly cold winters, seasons of flooding and drought, years without a summer, famine, plague, and revolution to become more successful.

> We can now track the Little Ice Age as an intricate tapestry of short-term climatic shifts that rippled through European society during times of remarkable change—seven centuries that saw Europe emerge from medieval fiefdom and pass by stages through the Renaissance, the Age of Discovery, the Enlightenment, the French and Industrial revolutions, and the making of modern Europe. (Fagan 2000: xiv)

However, we are not only called to survive and adapt, but to thrive in God's creation. Ultimately, we are all called to be stewards of the Earth and that encompasses not only our neighbor but also nature itself. The ultimate authority to whom we are accountable is God, and we must put our faith in Him that we will be protected and guided by His infinite grace. The ethics and recommendations of science are nothing compared to what we are called to do as good

neighbors and stewards of the Earth. Our first and foremost priority is our covenant with God, and our obligation to human ethics is secondary. Nonetheless, if we ignore our convent we neglect not just ourselves but the Earth, and by ignoring significant climatic changes we are doing just that. We can learn from the lessons our forbearers who suffered in their own struggles with climate change and amend our current course before we begin another significant shift in climate with possibly more devastating consequences. Thorsen suggests in his work on the Wesleyan Quadrilateral that, "Christians also need to advocate on behalf of correcting causes of impoverishment and injustice, lest unjust social and institutional practices continue to oppress people, individually and collectively" (Thorsen 2018, 17). I would also add that Christians need to advocate for the Earth as well.

The overall intention of this article has been to understand the intimate connection that exists between culture and climate and how the events from the Little Ice Age underscore that relationship. Through understanding the past, we can connect with it and give hope to the future. We need to consider our methods and motivations in order to learn how to do the right thing at the right time. Climate is an ever-changing organism, much like culture: one responding infinitely to the other in perpetuity. For the fate of humanity and for the fate of the Earth, we turn to what others have done before us, how they have adjusted, how they have thrived, and how they have responded to previous climatic events to determine their course. For as Margaret Mead is reputed to have once stated, "never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has" (Mead 2019). It is our responsibility to care for and nurture the planet that we call home. God has entrusted us with His miraculous creation and we must honor our covenant with Him.

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