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Energy, Technology, and Culture: The Paris Agreement, Social Conflict, and Cultural Evolution

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In this essay, I will explore anthropologist Leslie White's concept of cultural evolution and its relation to energy, technology, and social forces and conflicts. First, I will begin by summarizing White's key theoretical concepts and arguments in his 1943 essay, *Energy and the Evolution of Culture*. Second, by applying White's theory to the present-day issue of the Paris Agreement and the Trump Administration's intention to withdraw from it, I will show how conservative, reactionary forces in the social system (White 2016/1943, 262-263) attempt to impede cultural progress by clinging to traditional technology and energy systems, thus creating conflict between them and their more progressive opponents. Third, I will reveal and discuss some of the positive measures that are currently being taken by the progressive social forces in the United States and other regions of the world. Finally, I will conclude by providing my thoughts on what the future may have in store.

Written and published during World War II, when the United States and other nations were aggressively jockeying to establish world dominance, Leslie White's 1943 essay, *Energy and the Evolution of Culture,* convincingly revives and builds upon the 19th-century ideas that had been put forth by prominent unilineal evolutionists Lewis H. Morgan and Edward B. Tylor*,* effectively targeting Boasian scholars—historical particularists who largely rejected grand theoretical models like unilineal evolution because they often made abstract, sweeping generalizations that lacked sufficient supporting evidence (McGee and Warms 2016, 247-253; White 2016/1943, 270). From White's perspective, human culture develops according to the "material, mechanical mean with which man exploits the resources of nature" (2016/1943, 252), and he perceives culture as a form of behavior that primarily serves to satisfy the following basic human needs for survival: food, shelter, and defense from one's enemies (2016/1943, 252).

Central to White's theoretical argument is his law of cultural evolution, also known as "White's Law," which states that "culture develops when the amount of energy harnessed by man per capita per year is increased; or as the efficiency of the technological means of putting this energy to work is increased; or, as both factors are simultaneously increased" (2016/1943, 255). In other words, the efficiency in which humans are able to capture, control, and produce energy determines the degree of their cultural development; the more efficient energy production is, the more culturally evolved it is capable of becoming. This is because, as White states, "Other things being equal, culture evolves as the productivity of human labor increases" (2016/1943, 261). Therefore, the evolution of technology and energy production is ultimately responsible for altering and advancing culture because it results in more efficient and productive human labor, giving people the time, energy, and means to do things that would otherwise be impossible (White 2016/1943, 256, 261-262, 269; Lecture notes, 10/16/17).

To support his argument, White provides historical examples of technological innovations used to harness energy that have driven the evolution of culture and resulted in two cultural revolutions. The first cultural revolution was the Agricultural

Revolution, which began roughly twelve thousand years ago following developments in animal husbandry and, more importantly, agriculture (White 2016/1943, 258). According to White (2016/1943), this was the first time that humans began "harnessing the forces of nature" (258) instead of simply exploiting them; by domesticating animals and cultivating plants in greater scale, humans vastly increased their ability to procure food, "the first necessity of life" (258). Furthermore, "Agriculture increased tremendously the amount of energy per capita available for culture-building, and, as a consequence of the maturation of the agricultural arts, a tremendous growth of culture was experienced" (259). Essentially, the proliferation of food surpluses provided humans with a substantially greater degree of security and made it possible for sedentism, larger populations, and increased social complexity with a hierarchical division and specialization of labor to exist (White 2016/1943, 259). This consequently led to increased social stratification and inequalities, the accumulation of wealth, the development of private ownership (i.e., property), and the creation of the arts, sciences, and, ultimately, the State (White 2016/1943, 258-259). The second great energy revolution was the Industrial Revolution, which began roughly three hundred years ago when humans successfully harnessed a new energy source, this time in the form of fuel—i.e., steam—with fossil fuels such as coal, oil, gasoline, and natural gas coming shortly thereafter (White 2016/1943, 260-261). The invention of engines and machines designed to harness these highly efficient energy sources unlocked an entirely new realm of possibilities, including the mass production of food and material goods—such as textiles, plastics, vehicles, tools, computers, etc.—the consumption of said goods, and the creation of large metropolises. Ultimately, the ability to harness steam and fossil fuels led to the development of the modern market-based civilization as the world knows it today.

However, it is crucial to note that White stresses that cultural evolution is neither guaranteed nor inevitable. Instead, the energy and technologies utilized by human culture at any given time have finite limitations that restrict the potential for cultural growth and growth will eventually come to a halt unless its social system encourages the development and adoption of new technologies that improve energy production (2016/1943, 262-264). Thus, the social system, which may take a progressive or conservative position in response to change, ultimately determines the extent of its own cultural development. Furthermore, it may take hundreds or thousands of years before new energies and technologies replace the old ones and revolutionize culture, as was the case with both the Agricultural and Industrial Revolutions, the latter being only about three hundred years old (White 2016/1943, 262-265). For example, if there is an overwhelming lack of incentive for progress within a society—or should an influential, conservative faction of society reject or prevent the adoption of new energy sources and technologies due to conflicts between traditional systems and those of the future—cultural development will cease, thus causing a period of cultural stagnation or, possibly, regression (White 2016/1943, 263-265). It is this specific argument which I will draw upon the most for the remainder of this essay. But first I should provide some context for the Paris Climate Accord, which I will henceforth refer to as the Paris Agreement.

After being drafted and negotiated by representatives of 195 different nations, the Paris Agreement was adopted by consensus on December 12th, 2015 (Davenport 2015). Since then, 171 out of the 197 parties involved have formally ratified the agreement, making it a landmark achievement for the environment, global diplomacy, and humanity (United Nations 2017); some of the countries that have not yet ratified the agreement include Iraq, Russia, Turkey, Colombia, Iran, Lebanon, Libya, and Mozambique (United Nations 2017). The central goal of the Paris Agreement is to prevent, or at least limit, many of the catastrophic dangers associated with climate change by maintaining the global temperature at "well below 2 degrees Celsius above pre-industrial levels" (United Nations 2017) for the remainder of the century, and "to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius" (United Nations 2017). These ambitious targets will require the planet's nations—especially its top energy consumers and polluters, such as the United States and China—to work diligently together to slash carbon-based greenhouse emissions (Davenport 2015).

Since 1900, the global carbon (CO_2) emissions from fossil fuels have increased dramatically, particularly since the mid-20th century; from 1970 to 2011, global CO_2 emissions "increased by about 90%, with emissions from fossil fuel combustion and industrial processes contributing about 78% of the total greenhouse gas emissions increase" (United States Environmental Protection Agency 2016). In 2010, 25% of global greenhouse gasses emitted were from electricity and heat production, 21% from industry, 14% from transportation, and 6% from buildings, and, in each of these sectors, the largest contributing factor was the burning of fossil fuels (United States Environmental Protection Agency 2016). Ultimately, the only feasible way of accomplishing the goals of Paris Agreement is to virtually eliminate the global consumption of, and dependence on, fossil fuels—i.e., coal, oil, gasoline, natural gas, diesel, etc.—by the end of the century, meaning humanity will need to hastily strive for the transition to clean, non-carbon emitting energy sources such as wind, solar, nuclear, geothermal, hydroelectric, and tidal (Davenport 2015; Va de Graaf 2017, 184).

Although White's essay was published some seventy-four years ago, he envisioned such an energy transition was on the horizon and believed that it would be responsible for the next stage of cultural evolution so long as the future energy (or energies) could be harnessed more efficiently than fossil fuels (2016/1943, 266). Furthermore, White (2016/1943) presciently imagined the possibility of harnessing "Wind, water, waves, tides," (266) and nuclear energy, though he was especially optimistic about the potential of solar energy: "But there is always the sun, from which man has derived all of his energy, directly or indirectly, in the past. And it may be that it will become, directly, our chief source of power in the future" (266). Although humans have since invented technologies capable of harnessing all of the aforementioned energy sources, new, more advanced technologies will need to be developed and produced in greater scale to reduce costs before these energies can replace fossil fuels in a significant way.

A year ago, it looked these technological developments were indeed on the horizon, and the future of energy and technology in the United States was looking rather promising. For example, on October 5th of 2016, President Barack Obama delivered a brief, optimistic speech from the Rose Garden about the Paris Agreement and its relation to climate change, energy, technology, the economy, and the future of the planet and humanity:

> Today is a historic day in the fight to protect our planet for future generations. . . . Today, the world meets the moment. And if we follow through on the commitments that this agreement [Paris Agreement] embodies, history may well judge it as a turning point for our planet. . . . [The Paris Agreement] will help other nations ratchet down their dangerous carbon emissions over time, and set bolder targets as technology advances . . . And by sending a signal that this is going to be our future—a clean energy future—it opens up the floodgates for businesses, and scientists, and engineers to unleash high-tech, low-carbon investment and innovation at a scale that we've never seen before. So this gives us the best possible shot to save the one planet we've got. (The White House 2016)

Based on his remarks, it is abundantly evident that President Obama sees how crucial it is for the planet's nations and citizens to work together to ensure the survival of our planet and its biodiversity. More importantly, he sees an optimistic future for the United States and humanity which is defined by profound change and progress led primarily by advancements in technology and clean energy, not fossil fuels; thus, it seemed like the United States was committed to lead the way for sparking the next phase of technological and cultural evolution that White anticipated. However, President Obama's successor has a drastically different, far more conservative vision and approach.

The inauguration of President Donald Trump—a vocal supporter of the coal and oil industries—promptly sent efforts of climate change mitigation and the prospect of the United States leading the transition to green, renewable energy sources into a tailspin. The new president, who has previously declared that global warming is a "hoax" (Foran 2016), has filled his administration with several individuals who have denied the existence of anthropogenic climate change and are intimately tied to the fossil fuel

industry—such as Environmental Protection Agency (EPA) Administrator Scott Pruitt, Secretary of Energy Rick Perry, and Secretar of State and former ExxonMobil CEO Rex Tillerson. And, over the past several months, the Trump Administration has actively beer striving to undo many of the accomplishments, policies, and regulations of their predecessors, including those related to energy and the environment (Dennis 2017; Green 2017; Jacobson 2016).

In less than one year, the Trump Administration has blocked President Obama's Clean Power Plan, which was designed to slash greenhouse gas emissions produced by fossil fuel-fired power plants; halted a regulation that restricted the leaking of methane—which is significantly more potent than the greenhouse gas CO_2—caused by drilling operations on federal lands; reversed a ban implemented by President Obama which prevented companies from drilling for oil in the Arctic; rescinded a rule that regulated fracking on public lands; dismissed more than a dozen academic members from their positions on the EPA's Scientific Advisory Board; terminated a regulation that prevented the dumping of mining-related waste into streams; and has taken steps to rollback strict fuel efficiency standards for the automotive industry (Bump 2017). Most recently, President Trump made a bold, unprecedented move by drastically reducing the size of two widely cherished national monuments—Bears Ears by 85% and Gran Staircase-Escalante by roughly 50%—in Utah, effectively putting them and other national monuments in serious peril of being exploited and irrevocably destroyed for their resources and land (Turkewitz 2017).

Of course, the aforementioned acts of regression are, for the most part, unsurprising, especially considering the significant amounts of lobbyist money that members of the Trump Administration and many other conservative politicians have received from the fossil fuel industry, which spends enormous sums of money in order to secure a considerable degree of influence over U.S. policy makers, thus bettering the industry's chances of maximizing future profits for their shareholders (Zhang et al. 2017, 2) For example, in the 2016 U.S. election cycle alone, ExxonMobil's Political Action Committee (PAC) contributed nearly $1.5 million to political candidates, 90% of which went to Republicans, while Koch Industries' PAC contributed another $1.54 million, 99% of which went to Republicans; overall, PACs associated with the gas and oil industry contributed more than $15.1 million to politica candidates, more than $13.4 million (89%) of which went to Republicans (The Center for Responsive Politics 2017). And considering the legislative and executive branches of the U.S. government are currently controlled by Republicans, it should not come as a shock that the nation's involvement in the Paris Agreement is now in jeopardy.

From President Trump's "America first" perspective, the Paris Agreement and strict environmental regulations on carbon emissions are believed to threaten the economy and employment opportunities in the United States and weaken national sovereignty; thus, on June 1st, 2017, President Trump announced his plan to withdraw the nation—the second-largest contributo to carbon emissions in the world—from the Paris Agreement (Dennis 2017; Lide 2017; Zhang et al. 2017, 2). And instead of investing in the development of technologies to harness clean or renewable energy sources, the Trump Administration, whose members are seemingly hell-bent on resisting progressive change, believes the United States should significantly cut funding for renewable energy programs and revise policies to instead promote the extraction, production, consumption, and trade of traditional sources of energy, particularly coal and oil (Klare 2017; Noll 2017). In other words, by continuing to reverse the agenda and policies that were set forth by the Obama Administration, the Trump Administration is diligently working to satisfy the interests of the fossil fuel industry by obstructing the transition to new, non-traditional energy sources—or at least they are trying to.

Although the political atmosphere in the United States has been rather turbulent over the past several months, there is still a degree of hope for the future. As White argues, "In culture as in mechanics, the greater force prevails. . . . So in the case of technology-institutions conflicts: if the force of the growing technology be great enough, the restraining institutions will give way (2016/1943, 264). And it appears that is precisely what is going to happen. On November 7th, 2017, the Syrian government announced its intention to join the Paris Agreement, leaving the United States as the sole nation in the world standing in opposition to the agreement (Dennis 2017). Additionally, while the U.S. government isolates itself, other nations may seek to take

advantage of the situation, which could effectively force conservatives and the Trump Administration to reconsider their position China, for example, has been investing heavily—$88 billion in 2016, with plans to invest a total of $360 billion by 2020—into solar and wind technologies in an effort to become the planet's leading producer of renewable energy (Klare 2017; Noll 2017). Likewise India is actively pursuing the development of technologies that will allow them to reduce their dependence on fossil fuels, and, b 2022, it is estimated that as much as forty percent of the nation's electricity will come from clean energy sources (Klare 2017).

Even within the United States, there are numerous grassroots movements, states, cities, and influential companies that have expressed considerable dissent over President Trump's intent to withdraw the United States from the Paris Agreement (Green 2017; Victor 2017). For example, top executives from companies such as Apple, Twitter, Facebook, Amazon, Google, Microsoft, SpaceX, Disney, Tesla, Goldman Sachs—and even energy company Shell—quickly spoke out to denounce President Trump's plan (Victor 2017). Similarly, fourteen states and one U.S. territory, Puerto Rico, have responded by joining the United States Climate Alliance (USCA), a bi-partisan coalition that was created by state governors Jay Inslee (D-WA), Andrew Cuomo (D-NY), and Jerry Brown (D-CA) (United States Climate Alliance 2017). The USCA declares that "Despite the U.S. federal government's decision to withdraw from the Paris Agreement, Alliance members are committed to supporting the international agreement, and are pursuing aggressive climate action to make progress toward its goals" (United States Climate Alliance 2017). Overall, members of the USCA currently represent more than 36% of the U.S. population, at least $7 trillion dollars in GDP, and 1.3 million jobs in the clean energy sector of the U.S. economy (United States Climate Alliance 2017); contrary to the belief held by President Trump and many of his fellow Republicans that the Paris Agreement and environmental regulations are "job killers," the clean energy sector currently employs approximately three million people in the United States, and employment in the solar industry has been booming, accounting for one in fifty new U.S. jobs created in 2016 (Klare 2017; Noll 2017). Thus, since many Americans and virtually all of the world's nations seem to be actively committed to mitigating climate change by cutting greenhouse gas emissions and dependence on fossil fuels—and as clean energy continues to become more practical, affordable, and efficiently harnessed without the U.S. government's support—it appears the conservative members of society will be significantly outmatched in this conflict, even though they temporarily have a stranglehold on U.S. policy making.

In conclusion, the Trump Administration's intention to withdraw the United States from the Paris Agreement is rather imprudent, as it will, among other things, almost certainly hinder the potential to meet the ambitious goals of the Paris Agreement, thus needlessly increasing the risk of climate change and its many associated dangers. However, when one begins to look past the regressive role of the current U.S. government, a glimmer of hope for the future becomes apparent. If White's theoretical argument is correct, which much of it appears to be, the technological forces will ultimately prevail over the conservative faction and institutions of society. Besides the fundamental fact that fossil fuels are finite, unsustainable resources becoming increasingl limited in supply, it appears that the tremendous social and economic pressures from the progressive group—who is globally committed to fight climate change and propel the transition to more efficient, non-traditional energy sources—will eventually be too great for the conservatives to continue their resistance efforts. In other words, the remaining holdouts in the U.S. government will essentially be forced to adapt in order to avoid political blowback, maintain geopolitical power and alliances, and keep the U.S. economy afloat as fossil fuels become an obsolete commodity. Thus, because it appears more probable than not that humanity will transition to clean energy production in the future, the Trump Administration and their fellow conservatives would be wise to reevaluate their current agenda, come out of isolation, and join the rest of the world in this unprecedented progressive movement sooner rather than later, otherwise there could very well be significant ramifications to contend with beyond those associated with climate change. If the U.S. government and the extraordinarily powerful, avaricious fossil fuel industry continue to delay progress for short-term financial gains while, in the meantime, another nation successfully develops the technology to harness clean energy in such a way that it could feasibly replace fossil fuels, the United States may end up forfeiting its status as global hegemon, perhaps to the nation President Trump believes is responsible for inventing global warming: China.

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