ADVOCATING SCIENTISM, 1963-2013

A Thesis
by
DYLAN JAMES

Submitted to the Graduate School
at Appalachian State University
in partial fulfillment of the requirements for the degree of
MASTER OF ARTS

August 2014
Department of History

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APPROVED BY:

Michael C. Behrent
Chairperson, Thesis Committee

Amy Rutenberg
Member, Thesis Committee

Michael G. Wade
Member, Thesis Committee

James Goff
Chairperson, Department of History

Max C. Poole, Ph.D.
Dean, Cratis Williams Graduate School

Abstract

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Dylan James

B.A., Western Carolina University
M.A., Appalachian State University

Chairperson: Michael C. Behrent

By the nineteenth century, scientism began to emerge as a worldview that sought to explain all phenomena through the scientific method to the exclusion of all other ways of knowing. These sentiments intensified with Charles Darwin's discovery of evolution by natural selection. At the turn of the twentieth century, scientific discoveries increased exponentially, giving rise to a strong confidence that science could indeed describe everything. By 1960, certain scientists grew so confident in science's descriptive ability that they started to advocate scientism. From 1963 to 2013, they advocated an antireligious, positivistic worldview through their popular works and warned of concurrent global conundrums such as the existence of nuclear weapons, global warming, and overpopulation. They envisioned a human future in space as a possible means to avoid earthly problems.

Acknowledgments

I would like to thank my father.

Dedication

For my mother.

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Introduction

Advocating Scientism Defined

This thesis argues that scientists Carl Sagan, Stephen Hawking, and the New Atheists advocated scientism through works marketed as popular science. Scientism can be defined as "The view that characteristic inductive methods are the only source of genuine factual knowledge and, in particular, they alone can yield true knowledge about man and society."[1] The term emerged during the military-industrial complex boom in the wake of World War II to describe scientists who adhered to a faith that science could explain all phenomenon. Far from submitting to the derogatory connotations of the word, the scientists under investigation here viewed all that it embodies in a positive light and more radically pushed a scientific worldview as time progressed. While they did not use the word "scientism" to describe themselves, they displayed behavior that fit the term. Though the word originally had negative connotations (i.e., as an expansion of science beyond its acceptable scope), these thinkers ironically contributed to advocating the concept of scientism.

This thesis does not argue that scientist popularizers caused scientism to become popular. The scientists advocated scientism within popular science works. This is an action they undertook. To clarify, this is the definition of advocate that fits the context of the popularizers' actions: "Advocate- publically recommend or support something."[2] From this definition, it is apparent that advocate can be used as an action that someone undertakes without it actually having a measurable effect. It is beyond a reasonable doubt that Sagan, Hawking, and other popularizers popularized science. This thesis argues that it is beyond a reasonable doubt that

[1] Alan Bullock and Stephen Trombley, *The Norton Dictionary of Modern Thought* (New York: Norton, 1977), 775.
[2] Maurice Waite, *Pocket Oxford English Dictionary* (Oxford: Oxford University Press, 2013), 13.

they advocated scientism; that they pushed a scientific worldview through popular science works.

Chronologically, this thesis provides a unique theoretical framework as to how scientism progressed from the mid twentieth to early twenty-first century. It illustrates how the embodiment of a negative term can actually be utilized as a positive force for those under critique. It also displays various dialectics between political and quasi-political entities and how they characterized how history progressed during the period under examination. A clear dialogue existed between the United States and the Soviet Union that caused an arms race and an increase in science and technology. There was a dialectic between scientism/modernism on one hand and postmodernism on the other. There was a dialectic between scientism and religion, and a dialectic between scientism and the Christian Right. The dialectics can overlap. For instance, scientism opposed the Christian Right, but both scientism and the conservative establishment had interest in the military-industrial complex. It is important to understand the role of scientism within the broader network of dialectics, and this thesis approaches it through examining popular works.

This thesis shows how proponents of scientism sought to spread a scientific worldview despite opposing forces and negative critiques of science. They used books, documentaries, television shows, and expositions marketed as popular science. Legitimate popular science education became a political platform for the scientific worldview. Furthermore, this thesis measures these methods of delivery, showing that they were quite popular (this does not mean that scientism itself became popular, though it is an interesting notion). Their works toped bestseller lists, sold millions of copies, garnered millions of viewers, and gathered thousands of attendees. This thesis also shows how proponents of scientism actually influenced world leaders.

Finally, it exposes the potential fallacies and inconsistencies of scientism—the supposed linear and progressive history of science, science's supposed supremacy over religion and philosophy, and science's power to overcome global problems of nuclear weapons, global warming, and overpopulation even though scientific advances caused these things to occur in the first place. It is important to understand these viewpoints, how they were spread, how they progressed, and their influence on the public.

The Importance of Darwin

Before Charles Darwin's 1859 publication of *On the Origin of Species*, it still remained possible to reconcile religion with advances in science. His work made this more difficult. Evolution by means of natural selection shows that life on Earth appeared as a result of natural processes, and not because God ordained it. In 1899, humans had yet to discover the true age of the Earth. While fossil evidence of extinct creatures and the laboriously slow rates of sedimentation led geologists to believe that the Earth was much older than 6,000 years, they could not give a definite age. They haphazardly guessed somewhere in the tens of millions of years old. At this point in time, humans had not discovered galaxies, relativity, quantum mechanics,[3] the DNA molecule, or the Big Bang Theory. They had not created airplanes, atomic bombs, or sent manned missions to space. By 1960, they had done all of this. Scientific discoveries had primed scientists for scientism.

[3] Quantum mechanics is an area of physics that studies subatomic particles that behave in a probabilistic, non-deterministic manner according to the Heisenberg Uncertainty Principle (Werner Heisenberg, 1927).

Conceptual Explanation

After World War II, the United States possessed an unprecedented faith in science. Theoretical and technological advances had won them the war at the cost of their own and their enemies' lives. During this period, many scientists exhibited an underlying scientism that believed that science could solve all human problems. Many scientists who had worked on the Manhattan Project attempted to assert international control over nuclear energy by taking part in the Atomic Scientists Movement. These scientists' actions foreshadowed future scientists' attempts to resolve global issues. A paranoid, post-war United States government materialized under President Harry Truman that oppressed the scientists' wishes and solidified the military-industrial complex's control over nuclear energy. World War II caused a broad feeling of scientism among scientists, but their attempts to exercise political control failed in the face of a power hungry, oppressive government preoccupied with fears of the Soviet Union. The nuclear weapon acted as the ultimate threat to rival powers and to the third world.

The military-industrial complex began constructing a network of command and control over nuclear weapons. This communication system came to consist of satellites and a computer network that was the precursor to the commercial internet. The information age would arise as the century progressed and catalyze the emerging scientism movement. As McCarthyism receded in the 1960s and the environmental movement and Vietnam War protests fomented a counterculture opposed to the culture of the military-industrial complex, scientists became more outspoken. In 1966, astrophysicist Carl Sagan began to write books that pushed a scientific worldview. In 1980, he starred in the miniseries *Cosmos* and wrote an accompanying book. The conservative administration of President Reagan escalated anticommunism and strengthened a program of privatization that shifted much of the military-industrial complex to corporate

interests. The Christian Right emerged as a radical religious entity opposed to scientific theories on the age and creation of the universe. In 1988, under the influence of Sagan, physicist Stephen Hawking wrote *A Brief History of Time*. Hawking brought a radicalization to late twentieth century scientism by suggesting that science might show that God was not needed for the universe to exist. His critics harshly fired back in numerous publications. Hawking retaliated in his book *Black Holes and Baby Universes* and continued to publish books that pushed a scientific worldview. During the 1990s, Sagan became more radical as well publishing *The Demon-Haunted World* that strongly insisted that the scientific method supersedes religion and mythological thinking.

In 2004, in the wake of the September, 2001 terrorist attacks and subsequent global war on terror carried out by the Bush Administration and British Prime Minister Tony Blair, Sam Harris Wrote *The End of Faith*. The book marks the beginning of the New Atheism movement. New Atheism is a more radical continuation of the program of scientism carried out by Sagan and Hawking. Sagan and Hawking heavily influenced the New Atheism movement and both took part in it. New Atheists like Richard Dawkins drew upon the theoretical advances of string theorists like Brian Greene and Michio Kaku. String theory allows for multiple universes and the multiverse insists that no God created the universe, but rather that the universe arose as a random quantum mechanical event. These events repeat infinitely and form multiple, parallel universes. Humans find themselves in a universe conducive to life because it is the only universe where humans could find themselves. The other universes are dead. In the 1970s, Brandon Carter presented this idea—the anthropic principle—in a conference in Poland, but the idea was never taken seriously until the second string revolution of the 1990s that reinforced string theory and the possibility of multiple universes. The New Atheists and the scientism

movement of the early twenty-first century utilized the anthropic principle as a legitimization of their denouncement of God. It can be found in multiple books, documentaries, articles, and speeches that sell a scientific worldview that seeks to undermine the place of God within the human mind. A scientific worldview is further propagated during the World Science Festival held in New York City annually since 2008. From 2008 to 2013, yearly attendance doubled from 100,000 to 200,000 people, indicating an increased public interest in science.

The Role of Science Fiction

Americans' extreme faith in science eroded shortly after the advent of the environmental movement, the Kennedy assassination, and the escalation of the Vietnam War. The 1960s counterculture coincided with critiques of modernism that insisted that the optimistic faith of the modern world—a faith in science, technology, and progress—had definitively ended. Some of these critiques can be found in art and literature. After World War II, the modern world could no longer initiate total war without the repercussion of annihilating entire nations, and perhaps humanity itself. Science fiction illuminates the fact that the postmodern movement did not exist as an academic phenomena alone. By examining a facet of popular culture associated with science—science fiction—it becomes clear that critiques of modernity permeated popular thought. Simultaneously, modernist critiques persisted. Throughout this thesis, science fiction will be used as a measure of modern and postmodern critiques of science within the cultural ethos of the public. Postmodern within this context simply means critiques of modernity, specifically modernity associated with progress, positivism,[4] industrialization, science, and

[4] Positivism is a philosophical train of thought that only recognizes logically or scientifically proven things.

technology. This thesis will show how the activities of scientists and artists might have influenced each other.

In doing so, this thesis will use science fiction as a primary historical source. Science fiction's fantastical and contemporaneous plotlines often reflect the modern world, or project the future of the modern world. They create a reflection of science within art that can be indicative of a positive or negative critique of modernity. Films like *2001: A Space Odyssey* and *Alien*[5] have been inducted into the United States Library of Congress for historical preservation for being "culturally, historically, or aesthetically significant."[6] They are a part of culture that reflect that culture; an expression.[7]

Phasic Explanation

Two distinct but overlapping and highly related sets of phases exist within this model—cultural phases and phases of scientism. The first cultural phase (1945-1962) was characterized by a post-World War II faith in science. This period was interrupted by Rachel Carson's *Silent Spring*, the environmental movement, the Kennedy assassination, and the start of the Vietnam War. The second phase (1963-1980) was characterized by the 1960s counterculture, protests against Department of Defense funds on college campuses and the Vietnam War, fear of nuclear war, and the environmental movement. The third phase (1981-1991), beginning with President Reagan's election, experienced a technological boom, increased conservatism, privatization, and

[5] Library of Congress, "National Film Registry Titles 1989-2013," National Film Preservation Board, accessed July 28, 2014, http://www.loc.gov/film/registry_titles.php.
[6] 100th United States Congress, *Public Law 100-446*, September 27, 1988.
[7] The United States Congress thought that such films were so culturally, historically, or aesthetically significant that they allocated 250,000 dollars for their preservation under the National Film Preservation Act of 1988.

anticommunism. The last phase (1992-2014) began with the fall of the Soviet Union, the creation of the commercial internet, and the emergence of the information age.

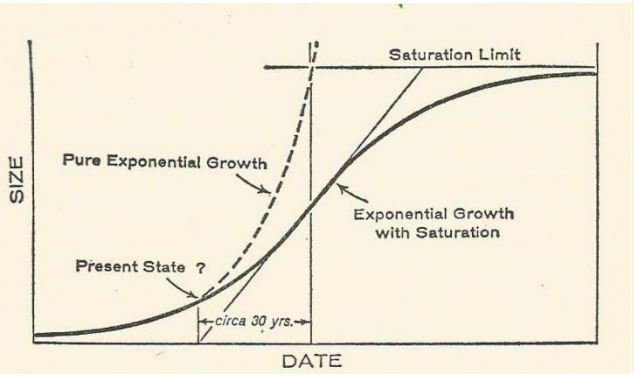
Mid-twentieth century and early twenty-first century scientism possessed four key characteristics and can be roughly divided into four phases. One, it supported an atheist or agnostic position. Two, it claimed a linear history of science beginning with ancient Greece. Three, it held that science and the scientific method were the best way of knowing, to the exclusion of religion and, in more radical form, philosophy. Four, it insisted that science would find the answers to global problems such as nuclear weapons, global warming, and overpopulation.

During the first phase of scientism (1945-1966), social scientists recognized an emerging trend of scientism. In the 1952 book *Scientism, Man, and Religion,* D.R.G. Owen commented on the sociological impact of this growth—science "has acquired tremendous prestige and has risen in spite of itself to a position of predominant authority in our age." It "has come to be worshiped as omniscient, omnipotent, and the bearer of man's salvation." And, "We may call it scientism or scientolatry."[8] Owen recognized the underlying elements of scientism in the 1950s.

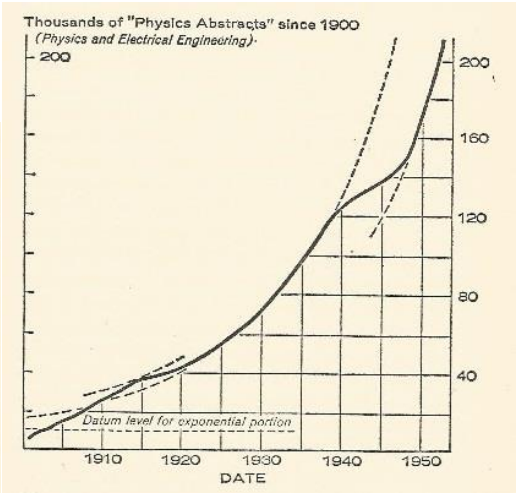
In 1963, Professor Derek de Solla Price published a study that concluded that science had grown exponentially since its inception during the late seventeenth century. His study measured the number of scientists and scientific publications.[9] According to Price, this exponential growth could not continue indefinitely. Science would reach a point of saturation where the exponential curve leveled off to a more stable maintaining state. Price suggested that sometime during the 1940's or 1950's science might have passed through the midpoint of logistic growth, meaning

[8] D.R.G. Owen, *Scientism, Man, and Religion* (Philadelphia: The Westminster Press, 1952), 20.
[9] Derek de Solla Price, *Little Science, Big Science* (New York: Columbia University Press, 1963), 8.

that the growth of science should have begun to level off.[10] At this moment in time, it appeared to some scientists that science could explain anything. Below are two of Price's graphs that illustrate this concept:



General Form of the Logistic Curve[11]



Physics Abstracts Published Since 1900[12]

During the second phase (1966-1987), astrophysicist Carl Sagan (1934-1996) began to write books that advocated a scientific worldview. Sagan grew up in New York City. He received his PhD from the University of Chicago. Among his other interests were chemistry and biology, especially exobiology where he speculated upon life on other worlds. He is best known for his role as the narrator in the television series *Cosmos* that aired in 1980. The series explained concepts of evolution and the human position within the universe. Sagan's scientific worldview consisted of an agnosticism that claimed that science arose in ancient Ionia as an alternative to mythological, superstitious thinking; he asserted that the scientific method was the best way of knowing about the universe. He spoke of the dangers of a public that did not

[10] Ibid., 30-31.
[11] Ibid., 21.
[12] Ibid., 18.

understand science and vehemently warned against nuclear weapons, global warming, and overpopulation.

In 1966, *Star Trek* debuted bringing the essence of the scientific worldview with it. The show synthesized all the elements of the new discoveries into a quasi-militaristic crew embedded with western scientific mores. Indeed, the crew of the Enterprise thought that most problems could be approached using the scientific method. These problems played out on a television, in a galaxy strewn with anti-protons, faster than light speed travel, and allusions to a benign Federation of Planets. In the world of *Star Trek*, twentieth century scientific theories, advancements, and applications converged under the direction of an interstellar Republic whose virtues resembled those of the modern Anglo world. Captain Kirk's deep instinctual urges seem to undermine a scientific proclivity, especially when countered by the rote rationality of his first officer Spock. Under close examination, however, they reveal the two sides of the scientific personality—logic and intuition. Popular culture reflected the prevalence of scientism that scientists began to advocate in their works. It is difficult to determine whether science influenced art first, or art influenced science.

During the third phase (1988-2003), theoretical physicist Stephen Hawking (1942-) added a radicalization to Sagan's scientism by questioning Gods existence in his 1988 book *A Brief History of Time*. He received a PhD from Cambridge in 1966. In his popular book, he discussed black holes and the particular manner in which they emit what is now known as Hawking Radiation. Hawking is an atheist who also claimed that science arose in ancient Ionia as a rational method of knowing that superseded myth and religion. He claimed that philosophy was dead and that scientists were the bearers of the torch of knowledge. Hawking insisted that

the public understand science to be able to put pressure on world governments to face issues such as nuclear weapons, global warming, and overpopulation.

During the last phase (2004-2014), multiple scientists took part in a scientism movement, both directly and indirectly, known as the New Atheism movement. According to the New Atheists, their movement began in 2004 with the publication of Sam Harris's *The End of Faith*. Closer examination reveals that a dead Sagan and a cybernetic Hawking both strongly influenced and took part in the movement. Individuals of interest include Richard Dawkins, Brian Greene, and Michio Kaku. Dawkins is an outspoken English biologist popularly known for his 2006 book *The God Delusion*. Greene, who received a PhD from Oxford in 1987, is a theoretical physicist, author of multiple popular science books, and cofounder of the World Science Festival in New York. Kaku is also a theoretical physicist and the author of many popular science books. Dawkins, Kaku, and Greene all wrote books that pushed a scientific worldview and used the anthropic principle—a keystone of the New Atheist argument—to undermine God.

Historical Background and Historiography

Cold War, Hot Science

Writing in the book *Flash Effect: Science and the Rhetorical Origins of Cold War America* (2002), historian David J. Tietge claimed that one of the reasons that science grew to such prominence in the mid twentieth century is because "we find no precedent for the speed with which we have progressed in the last century." As an example, he stated that between 1903 and 1969 the United States progressed from the Wright Brothers brief flight to a moon landing. He further pointed to improvements in agriculture, transportation, communication, weather

predictions, and medical diagnoses. Similarly, no other period has been wrought with such destruction. Technological advancement contributed to the death toll of two world wars.[13]

Tietge recognized a strong prevalence of scientism in post-World War II American thought. Far from outright rejection of the atomic detonations over Japan, many Americans viewed the event as a necessary evil. The United States now possessed technology that granted them hegemony over the entire planet. Tietge asserted that the bomb reinforced an Enlightenment idea in the American mind: "science would help us overcome any obstacle, any conflict, and problem." And, "Rational thinking and the scientific method were the panacea for all our social, political, economic, and diplomatic ills…."[14] In short, science could explain everything and fix any problem.

Tietge took the enterprise of science past any pragmatic function and said it is "even a belief system."[15] Vast ranks entered into the scientific field. The GI bill encouraged veterans to seek education in science and technology to secure America's advantage. The security of America's future and preservation of global hegemony hinged upon increased nuclear weapons research.[16]

Tietge's book argued that science grew to a privileged position that was beyond reproach. In the minds of many Americans, it had won the war. Its epistemological claims could not be questioned. "Priests" of science protected "conceptual dogma."[17] Scientists' work was self-legitimizing and intentionally mystified. Between 1947 and 1960, the United States perpetuated

[13] David J. Tietge, *Flash Effect* (Athens: Ohio University Press, 2002), vii-viii.
[14] Ibid., ix.
[15] Ibid., x.
[16] Ibid.
[17] Ibid., xiv.

the growth of the military-industrial complex. Methods of perpetuation included anticommunist propaganda and the Red Scare.[18]

According to historian Jessica Wang in her book *American Science in an Age of Anxiety* (1999), atomic scientists initially tried to resist government control of nuclear energy. During the Second World War, most scientists did not question the research and use of nuclear weapons. After the war, their position changed dramatically. Many scientists began to imagine a world plagued with weapons and a potential nuclear holocaust. Between 1945 and 1946, they took part in the Atomic Scientists Movement. These scientists aimed for international atomic cooperation and insisted that only through such action could nuclear power be safely controlled. The scientists founded organizations such as the Atomic Scientists of Chicago—approximately 200 scientists who had worked on the Manhattan Project and began publication of the *Bulletin of the Atomic Scientists* in 1945,[19] the Association of Oak Ridge Scientists, and the Association of Los Alamos Scientists. The Federation of American Scientists became the preeminent body. Together they agreed that nuclear weapons could not sustain long-term security. Their support of internationalism connected them with the progressive left.[20]

The advent of the Cold War soon derailed much of the scientists' intentions. In 1945, Senator Brien McMahon introduced a bill to create the Atomic Energy Commission (AEC) and place it under civilian control.[21] The War Department objected to civilian control and much of the bill's original intent came under scrutiny after increased Soviet-American hostilities. In early

[18] Ibid., xvi-xvii.
[19] University of Chicago, "Guide to the Atomic Scientists' Printed and Near-Printed Material Records 1945-1959," University of Chicago Library, 2006, accessed July 21, 2014, http://www.lib.uchicago.edu/e/scrc/findingaids/view.php?eadid=ICU.SPCL.ATOMICNEARPRINT.
[20] Jessica Wang, *American Science in an Age of Anxiety* (Chapel Hill: The University of North Carolina Press, 1999), 12-13.
[21] Ibid., 18.

1946, authorities in Canada arrested twenty-two people on charges of being Soviet spies. In March, Winston Churchill gave his famous Iron Curtain Speech calling for United States support against Soviet aggression in Eastern Europe.[22] The bill's dimension of civilian control began to erode. Aspects of internationalism disappeared and Congress replaced them with clauses of secrecy. In March, President Truman signed the Atomic Energy Act of 1946. The commission's agenda consisted of nuclear weapons research and production.[23]

The government gained more control and rhetorical force as the FBI and the House Committee on Un-American Activities (HUAC) exercised power to investigate individuals and label them as subversive. HUAC first focused its attention on those scientists who attempted to establish civilian and international control of nuclear energy. The activities of the HUAC intersected with the activities of the Military Affairs Committee which desired military control of atomic energy. HUAC attacked groups such as the Association of Oak Ridge Scientists and Oak Ridge Engineers and Scientists and labelled them as subversive.[24]

The FBI acted as an information gathering entity. They concentrated much of their effort on the Federation of American Scientists. The FBI's reports contained information claiming that the federation was antidemocratic, conspiratorial, and infiltrated by communists. The FBI applied this biased Cold War analysis to "normal political lobbying conducted by the federation."[25] The FBI stated that it only acted as a passive gatherer of information. Wang maintained, however, that the FBI attempted to persuade public opinion towards anticommunism. She claimed that FBI director J. Edgar Hoover funneled intelligence to the

[22] Ibid., 20-21.
[23] Ibid., 25.
[24] Ibid., 44-45.
[25] Ibid., 77-78.

media and Congress in an attempt to attack the political left. This intelligence included supposedly incriminating information on AEC scientists.[26]

In the book *In Sputnik's Shadow* (2008), Zuoyue Wang claimed that the government further silenced the political voice of scientists during the McCarthyism of the Eisenhower years. Senator Joseph McCarthy began to attack scientists with his anticommunist rhetoric.[27] J. Robert Oppenheimer himself became the target of the quasi-security state of the 1950s. He openly opposed the creation of the hydrogen bomb because of its destructive force and instead lobbied for the creation of the tactical nuke. To Oppenheimer's dismay, the military-industrial complex created both and added them to the diversifying arsenal of Cold War weaponry. The national security establishment—a multifaceted entity consisting of groups such as the DOD, FBI, Central Intelligence Agency, and the National Security Council—viewed Oppenheimer as a security risk and questioned the validity of a scientist making policy suggestions. In 1953, upon the request of his advisers, President Eisenhower revoked Oppenheimer's security clearance.[28]

Many scientists reacted negatively. Oppenheimer's colleagues on the Science Advisory Committee of the Office of Defense Mobilization (ODM-SAC) appealed to Vice President Richard Nixon on behalf of Oppenheimer and other scientists they felt had been unjustly targeted by rampant McCarthyism. Nixon largely ignored the appeal and even reported it to the FBI. The AEC held a hearing concerning the revocation of Oppenheimer's security clearance. The arbiters conducting the hearing demanded to know why Oppenheimer thought he had the right as a scientist to infringe upon policy issues. Oppenheimer responded that he was responsible for a

[26] Ibid., 81-82.
[27] Zuoyue Wang, *In Sputnik's Shadow* (New Brunswick: Rutgers University Press, 2008), 44.
[28] Ibid., 43.

revolution in warfare and felt he needed to play just as responsible a role as to what would happen with the products of that revolution.[29]

The launch of the Soviet satellite Sputnik shocked the American public in 1957. Eisenhower knew that the launch represented only a symbolic threat of Soviet incursion into American technological superiority because he had top secret access to U-2 spy plane photography. This information, however, could not be disclosed to the public because then the Soviets would learn of the extent of American intelligence. Eisenhower had to reestablish the public's confidence in American technology and the manner in which science intersected with government. In response to the Sputnik incident, he established the President's Science Advisory Committee (PSAC) out of the ODM-SAC. The creation of PSAC meant that the White House now had moderate scientists directly influencing policy decisions.[30]

In her book *Competing with the Soviets* (2013) Audra J. Wolfe argued that by 1960, tight government control over science and the military-industrial complex began to unravel. In 1954, hydrogen bomb testing at Bikini Atoll in the Pacific sparked debates over the harmful effects of radiation. Due to the unexpectedly large nature of the explosion and unpredictable winds, around 300 people were exposed to radiation. The AEC denied that fallout from nuclear tests posed a danger to Americans' health, even though crew members of the Japanese fishing vessel *Lucky Dragon* fell ill. Subsequently, strontium-90, a radioactive product of thermonuclear detonations with chemical properties similar to calcium was found in their bones.[31]

[29] Ibid., 45-46.
[30] Ibid., 74.
[31] Audra J. Wolfe, *Competing with the Soviets* (Baltimore: John Hopkins University Press, 2013), 107.

Geneticists took exception to the AEC's denial of harmful effects. They warned that radiation damaged chromosomes and could result in birth defects. In 1957, Caltech chemist Linus Pauling organized a petition of 2,000 scientists that called for the end to nuclear testing. The next year, Pauling and Edward Teller engaged in a televised debate over nuclear testing. The debate raised questions as to who was qualified to make decisions concerning nuclear policy. A group of St. Louis scientists, doctors, lawyers, and housewives responded to this question by creating the Committee for Nuclear Information that asserted that regular citizens had the right and responsibility to engage in issues of nuclear testing. The superpowers also recognized the dangers of nuclear testing. In 1963, President Kennedy and Premier Khrushchev signed a partial test ban treaty.[32]

The late 1950s represent only the beginning of discontent amongst scientists and the public over nuclear policy. The 1960s witnessed an explosion of protests on university campuses that intersected with the Civil Rights Movement and Vietnam War protests. Protesters sought to destabilize the military-academic-industrial complex. They believed, along with Vietnam War protesters, that military research did not belong on college campuses. In 1967, students at Princeton University protested a Defense Department think tank on their campus. In 1969, students, faculty, and scientists, some involved with national security projects, engaged in demonstrations on over thirty campuses throughout the country.[33]

Many scientists shared in the discontent that the military-industrial complex had infiltrated college campuses. To a certain extent, their activities as popularizers can be viewed as the reassertion of scientists' control over the cultural destiny of science—something that

[32] Ibid., 107-110.
[33] Ibid., 112.

resembles what the New Atheists would state in 2009. Similarly, their warnings against nuclear weapons and attempts to influence people to cause world governments to disarm echoed Oppenheimer's statement that he created a revolution in warfare and that he wanted to ensure what would happen with the products of that revolution.

Environs

Historian Benjamin Kline commented on a feeling of scientism present in post-World War II America in the book *First along the River* (1997). The atomic bomb gave the country a military edge. America became the most powerful country in the world. This power over nature and the other nations of the planet endowed scientists and government leaders "with the myth of scientific supremacy, which rationalized that science would fix everything…."[34] Kline pointed to an underlying American confidence in science and technology. Americans did not concern themselves, for the most part, with the possible detrimental effects of science, but rather concerned themselves with economic progress and the "good life." Products like DDT were "hailed as miracles of modern science."[35]

Where conservationism existed, it sometimes took the form of designating spaces for recreation, hunting, and fishing. Americans enjoyed outdoor activities, but recreation areas became increasingly crowded as time progressed. Certain literature reacted to this phenomenon in the form of neo-Malthusian theory which resurrected Thomas Malthus's fears of exponential

[34] Benjamin Kline, *First along the River* (San Francisco: Acadia Books, 1997), 73-74.
[35] Ibid., 74-75.

population growth. One such book, *Our Plundered Planet*, insisted that scientific methods cannot find new sources of food for an ever-growing population forever.[36]

America's lackadaisical response to environmental issues and continued confidence in science and technology would not last, however. In 1952, conservationist and biologist Rachel Carson published a book entitled *The Sea Around Us*. She explained the formation of oceans and their place within the Earth's ecosystem. Although it received popular acclaim, it did not deliver critical mass and incite a movement. A decade later, in 1962, *Silent Spring* would do just that.[37] The 50th anniversary edition of the book proudly proclaimed on the cover: "The Classic that Launched the Environmental Movement."[38] Kline concured and stated that "it heralded the beginning of the modern environmental movement."[39]

Carson's book increased Americans' consciousness of environmental issues. Most notably Carson brought to light the toxic effects of DDT used in pesticides and radioactive materials spread throughout the environment during nuclear testing. Carson elucidated the fact that the biosphere is one large integrated system and that the proliferation of these chemicals and products of nuclear fallout have far reaching effects. "Strontium 90, released through nuclear explosions into the air, comes to earth in rain or drifts down in fallout, lodges in soil, enters into the grass or corn or wheat grown there, and in time takes up its abode in the bones of a human being, there to remain until his death."[40] As for DDT, Carson characterized it as a dangerous

[36] Ibid., 75-76.
[37] Ibid., 76-77.
[38] Rachel Carson, *Silent Spring* (New York: Mariner Books, 2012).
[39] Kline, *First along the River*, 78.
[40] Carson, *Silent Spring*, 6.

carcinogen overlooked by the government and chemical industry that can end up in a mother's breast milk.[41]

Carson's work spawned the environmental movement, more green literature, and influenced a plethora of subsequent environmental laws. Barry Commoner's *Science and Survival* (1963) and *The Closing Circle* (1972) focused on science and morality. Ralph Nader began to warn of the pollution of auto emissions and Paul Ehrlich wrote *Population Bomb* (1968) that raised concern over overpopulation.[42] In 1970, Senator Gaylord Nelson orchestrated the first Earth Day celebration in which 20 million Americans took part.[43] The same year, the Nixon administration issued an executive order that established the Environmental Protection Agency. It seems almost certain that Carson's warnings about DDT played a primary role in the 1972 domestic ban on the substance. The following year, Congress passed the Endangered Species Act designed to classify and help protect species in danger of extinction.[44]

The environmental movement acted as both a cause and a catalyst to the discontent of the 1960s and 1970s. The movement did not end during the technological boom of the 1980s, but became intertwined with growing concerns over global warming. Adherents to scientism would warn of climate change issues and claim that science has the answer to the problem.

[41] Ibid., 225.
[42] Kline, *First along the River*, 82.
[43] Ibid., 84.
[44] Ibid., 95-96.

Carl Sagan: Prophet of Scientism

Introduction

This chapter argues that Carl Sagan was as the progenitor of a specific thread of scientism sold through works marketed as popular science. Sagan's scientism was characterized by agnosticism, internationalism, advocation of a space-based scientific culture, a progressive history of science, and an insistence that bad government caused the ills of the Cold War, not science itself. A raw cross-section of these tenants drawn directly from Sagan's popular works will be shown here as evidence that Sagan used popular science works to advocate the political agenda of scientism.

Much of Sagan's life and work sat at the intersection of science, science fiction, the Cold War, and the military-academic-industrial complex. Through his popular works, Sagan pushed a scientific worldview that stirred the public's interest in science and space exploration. His professional work, such as the Turco Toon Ackerman Pollack Sagan (TTAPS) study on nuclear winter and the Voyager missions, informed the activities of the President of the United States. Sagan's books sold millions of copies and he influenced the highest political office in the country.

Sagan's popular works advocated a distinct form of scientism. His scientism taught a particular history of science in which scientific endeavor began during the hunter-gatherer era and progressed to the present. In the beginning, humans described phenomena within the mythological framework of common religious thema,[45] such as sky gods. Then, humans replaced religious thema with more powerful and efficient scientific thema that used rational

[45] The term "thema" in this context comes from Gerald Holton's *Thematic Origins of Scientific Thought*. The term identifies discrete scientific ideas that change over time.

inductive reasoning rather than attributing phenomena to gods. Sagan praised the ancient Ionians for discarding superstition and developing the scientific method, and insinuated that their scientific tradition continued until today. For Sagan, this tradition embodied the best manner of knowing about the universe. This view of the history of science shaped Sagan's public role because it can be found throughout his popular works. He attempted to bring this worldview to a potentially scientifically illiterate public. But he also warned the public of the dangers posed by nuclear weapons, global warming, and overpopulation. Even a positivistic scientist like Sagan was haunted by the postmodern world. Throughout it all, however, he remained a proponent of scientism.

A Scientist in the Cold War Public Sphere

This section shows that science fiction and the Cold War influenced Sagan. In turn Sagan influenced the office of the president of the United States. It argues that Sagan took advantage of the conditions of the Cold War to push two tenants of his scientism—internationalism and a global space-based scientific culture—through popular works.

As a public intellectual who embraced scientism, Sagan's faith in science never diminished. The same cannot be said about the public at large. After World War II, American faith in science reached great heights. That faith began to transform, however, with the 1960s counterculture, the environmental movement, Vietnam War protests, and protests against Department of Defense funds on college campuses. Sagan remained a proponent of science who suggested that science be used for things other than war. He suggested diverting Cold War funds from weapons to exploration.

In 1954, during the height of McCarthyism and the suppression of the Atomic Scientists Movement, Isaac Asimov published *The Caves of Steel*. The book presented the reader with a dismal, overpopulated future Earth in which humans live in enclosed, communal cities devoid of sunlight and open air. An enclave of Spacers—human colonists from outer world Earth colonies—sits adjacent to New York City. Detective Elijah Baley finds himself in the midst of a murder investigation of an off-worlder. Despite Earthmen's objection to robots, Baley is forced into partnership with a Spacetown robot that closely resembles a human. Soon, the detective uncovers an outer-world plot to force cave-ridden communal Earth into executing another wave of planetary colonization. At first, Baley, who is well-versed in the Christian bible, remains superstitious of the purely mechanistic philosophy of the scientists of the outer worlds. Towards the end of the book, however, he grows fond of his robot partner and concludes: "The colonization of space is the only possible salvation of Earth."[46] Metaphorically, only pure mechanistic scientism and the exploration of space could defeat the communal Reds. In both science fiction and popular works of science, authors insisted upon a scientific worldview characterized by space exploration. Soon, however, popular science fiction more critical of modernity would sit parallel to modernistic science fiction; modernism and postmodernism coexisted as differing critiques of science.

Sometimes, science fiction and science authors knew one another. Sagan and Asimov first met for lunch in 1963. They had previously corresponded and Asimov learned that Sagan was an avid science fiction fan. They became good friends.[47] In 1968, Asimov attended Sagan's wedding to Linda Salzman. As an atheist, Asimov noticed that a rabbi conducted the

[46] Isaac Asimov, *The Caves of Steel* (London: Voyager, 1954), 205.
[47] Isaac Asimov, *In Joy Still Felt: The Autobiography of Isaac Asimov, 1954-1978* (Garden City: Doubleday, 1980), 302.

ceremony and concluded that this must have bothered Sagan.[48] During the Voyager project, Sagan consulted his friend Asimov about what should be included on the Voyager gold disc because science fiction writers with a background in science had been working on these problems for a long time.[49] The space race against the Soviets may have spurred the Voyager project, but for Sagan and Asimov it was a matter of passion, exploration, and human survival. Science no doubt informed science fiction, but science fiction also informed science proper. Sagan commented upon this curious fact: "The interweaving of science and science fiction sometimes produces curious results. It is not always clear whether life imitates art or vice versa."[50]

By 1960, in a non-fiction action to apply science against the Soviets, the military-industrial complex had thoroughly infiltrated higher education. That year alone, institutions of higher learning received 1.5 billion dollars in federal government funding. Much of it came from the Department of Defense (DOD), the National Science Foundation (NSF), the Atomic Energy Commission (AEC), and the National Aeronautics and Space Administration (NASA).[51] The McCarthyism that had censored the Atomic Scientists Movement had receded, however, and scientists took advantage of the more open political environment to voice their concerns over world events. In 1966, the American Association for the Advancement of Science (AAAS) passed a resolution condemning the Vietnam War. The resolution stated that the war threatened humanitarian values and goals. Scientists questioned whether or not cooperation with the Johnson administration in making war was in the best interests of mankind.[52]

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[48] Keay Davidson, *Carl Sagan* (New York: John Wiley and Sons, 1999), 206-207.
[49] Carl Sagan et al., *Murmurs of Earth: The Voyager Interstellar Record* (New York: Random House, 1978), 11.
[50] Carl Sagan, *Broca's Brain* (New York: Random House, 1974), 169.
[51] John R. Thelin, *A History of American Higher Education* (Baltimore: John Hopkins University Press, 2004), 278.
[52] Wang, *In Sputnik's Shadow*, 262.

Sagan preferred to use science for exploration and to push internationalism rather than for war. He obsessed over establishing contact with extraterrestrial life. His PhD dissertation entitled *Physical Studies of the Planets* discussed the possibility of life from other worlds. Sagan continued work concerning aliens as a member of a United States Air Force committee that investigated UFO sightings. He published numerous works concerning extraterrestrial life and outspokenly advocated the SETI (Search for Extraterrestrial Intelligence) program.[53] His internationalism caused him to write a book about aliens with a Russian.

In 1966, Sagan served as an assistant professor of astronomy at Harvard. He took advantage of the more open political atmosphere to publish *Intelligent Life in the Universe* with Soviet scientist I.S. Shklovskii. The book might not have been possible under the paranoid McCarthyism of the previous decade. Sagan pointed out in the preface that he worked with Shklovskii despite the ideological differences. Shklovskii did not travel outside of the Soviet Union and Sagan had never travelled to the Soviet Union. "The probability of our meeting is unlikely…," Shklovskii once concluded.[54] Sagan and Shklovskii corresponded with one another from their own countries.

Intelligent Life in the Universe made informed scientific speculations about the possibility of life on other planets and teemed with references to thinkers of the past: "Most of the ancient Greek philosophers… thought that our Earth was not the sole dwelling place of intelligent life."[55] Others besides the Hellenes received attention. The authors discussed Roman philosophers, Copernicus, Galileo, Kepler, Newton, Huygens, and Voltaire in a somewhat chronological order that suggested the progress of the scientific enterprise. Each chapter began

[53] Tom Head, *Conversations with Carl Sagan* (Jackson: University of Mississippi Press, 2006), xxi-xxv.
[54] Carl Sagan and I.S. Shklovskii, *Intelligent Life in the Universe* (San Francisco: Holden-Day Press, 1966), 3.
[55] Ibid., vii.

with a historical quote from thinkers, leaders, or writers of the past concerning science or life on other worlds. From the beginning of his career, Sagan framed his popularization from the standpoint of scientific progress.

Around the same time, Stanly Kubrick dropped a postmodern bomb that made the Enterprise boys shake in their Starfleet boots. His movie *2001: A Space Odyssey* (1968), based upon writing by Arthur C. Clarke, left audiences in a state of ambiguous, unfulfilled shock. The movie began with a group of pre-human apes staring at an alien artifact erected like a Mesopotamian shrine. Shortly, the movie jumps to the future where a group of humans are investigating a similar artifact on the moon. The lunar find causes a mission to the Jovian system on a huge spacecraft that harbors an artificial intelligence named Hal. As the craft's central computer system, Hal soon goes insane and kills most of the crew. A lone crew member thwarts Hal's final plans and shuts him down only to be sent whirling through a kaleidoscopic vortex to some extraterrestrial prefabricated eighteenth century abode where he lives out his life in solitude. Whatever the aliens' intention, some sort of offspring, benign or otherwise, spawned from the corpse of the dead crew member and returned to earth. This is where the movie ends leaving more questions than answers and casting doubts on the prospects of space exploration, artificial intelligence, and alien intentions.[56] This doubt sits in contraposition to fiction like *Forbidden Planet*, *Star Trek*, and *The Caves of Steel*, that pushed plotlines of successful space exploration and a scientific culture. Modern and postmodern science fiction sat parallel in time. One espoused a scientific culture; the other doubted it.

Sagan knew Arthur C. Clarke as well. Clarke suggested that Kubrick listen to Sagan's advice on the film. The three met and Sagan told Kubrick that it would be a mistake to show

[56]*2001: A Space Odyssey*, directed by Stanley Kubrick (Beverly Hills: MGM, 1968).

aliens in the movie. Kubrick may have taken Sagan's advice, but apparently Sagan annoyed Kubrick. The two were slated to meet again, but Kubrick said to Clarke: "I can't stand the fellow—make some excuse—say I'm busy tomorrow."[57] It is by no means certain, but it seems possible—judging from Kubrick's other films (*A Clockwork Orange* [1971], *Full Metal Jacket* [1987])—that Sagan's sentiments of scientism perturbed the postmodern artistic sentiments of Kubrick.

President Richard Nixon, elected in 1968, had his own relationship with science. Initially, the administration enjoyed cordial interactions with PSAC. Biologist Rachel Carson had published *Silent Spring* six years earlier. The book launched the environmental movement. In 1970, the first Earth Day was held. Nixon established the EPA and renounced the use of chemical weapons, actions that were well-received by scientists. Nixon's 1969 decision to alter the priorities of the new antiballistic missile system, however, divided PSAC and the administration. The new conception entailed a missile defense system safeguarding retaliatory ICBMs in lieu of protecting populated cities. Scientists thought the new system would destabilize the arms race and that it was not even feasible.[58] A further disagreement emerged between PSAC and the administration concerning plans for a supersonic transport plane. Scientists cited several key problems with the program and suggested its termination. Nixon disagreed and sought to continue the program despite PSAC's objections.[59]

Scientists' discontent with the Vietnam War escalated the disagreement between PSAC and the administration. They rejected American involvement in Cambodia and the Kent State University shooting.[60] Nixon sought to undermine PSAC credibility and scientists attempted to

[57] Davidson, *Carl Sagan*, 178-179.
[58] Wang, *In Sputnik's…*, 287-289.
[59] Ibid., 297.
[60] Ibid., 298.

retain a position of policy influence. The issue came to a close when Nixon disbanded PSAC in early 1973.[61] The same year, the Organization of Petroleum Exporting Countries (OPEC) imposed an oil embargo on many western nations in response to United States support of Israel during the Yom Kippur War. This spurred a general economic downturn. Coupled with Vietnam War protests, the environmental movement, and a decline in military spending on college universities, many scholars note this as a watershed moment when America's faith in science definitively declined.[62]

In 1970, Sagan took a job as an astronomy professor at Cornell and he chimed in on the debate concerning the manner in which public funds should be used for science in *Cosmic Connection* (1973). The book is a collection of essays, many of which discussed space exploration and the possibility of making contact with extraterrestrial life. Sagan dedicated three sections to arguing that there was a scientific, public, and historical interest in continued space exploration. Science had much to learn in the field of exobiology and planetology.[63] Humankind would gain a cosmic perspective that satiates their continuing curiosity.[64] Historically, ages of exploration and expansion spawned countless innovations, and Sagan insisted that space exploration would duplicate this phenomena.[65] Furthermore, modest space exploration could be paid for with the equivalent of just the overrun costs on what the United States spent on military projects such as the Minuteman III missile system.[66] Sagan even promoted using Soviet and American military men as the avant-garde of space exploration. "The more of them engaged up there, the less of them engaged down here."[67] This seems eerily like a

[61] Ibid., 306.
[62] Ibid., 309.
[63] Carl Sagan, *Cosmic Connection* (Cambridge: Cambridge University Press, 1973), 52.
[64] Ibid., 59.
[65] Ibid., 67.
[66] Ibid., 51.
[67] Ibid., 63-65.

real world argument for *Star Trek*. Sagan pushed a view of scientific progress through space exploration, used Cold War rhetoric, and asked for the funds to do it.

Cosmic Connection came in the midst of the NASA Mariner program. Similar to the PSAC scientists, Sagan's political parlance suggested how public funds should be utilized on scientific projects, in this case, to further propagate space programs. Both NASA and SETI were federally funded. Sagan sought to increase federal funding through influencing the body politic while the space craze of the 1969 moon landing still loomed large. At the same time, *Cosmic Connection* can also be viewed as a response to America's changing relationship with science. The environmental movement, the attempt to remove DOD activities from college campuses, and Vietnam War protests altered the public's view of science. If the demise of PSAC truly represented the culmination of a revolt against science, then Sagan's words were a counter-argument that science and the military could be used for a perceived good— the continuation of the marriage of the military and science into the final frontier.

After Nixon's 1974 resignation in the wake of the Watergate scandal, Gerald Ford assumed the presidency. Ford desired some level of scientific counsel in the White House, but was weary of the problems the previous administration had incurred. The President opted to establish a science office through a congressional act as opposed to a presidential order.[68]

The same year, Sagan published another book of essays, some that contained political undertones. *Broca's Brain* (1974) briefly assessed the phrenologically charged life of the French anthropologist Paul Broca, who lived in the nineteenth century. The book acted as a platform where Sagan could once again push for human space exploration. Before delving into the reasons for space exploration, he claimed that ancient Greek civilization was in many ways the

[68] Wang, *In Sputnik's…*, 313-314.

antecedent to our own. To the Greeks, Mediterranean meant "middle of the Earth." Space exploration cast a new perspective on notions of centricity and the human place in the cosmos.[69] Sagan outlined a range of possible space explorations and appealed to the public by saying they were within technological capabilities and did not require a much larger NASA budget. He also appealed to the Cold War climate of impending doom by saying, "human colonies on other worlds will make it far more difficult for the human species to self-destruct."[70] Only the colonization of space driven by the most advanced science could save the human species from their own self-destructive tendencies.

Broca's Brain briefly addressed what would come to be known as global warming. Sagan explained that some evidence showed a global temperature increase from the industrial revolution to around 1940 when the mean temperature dataset decreased in value. He attributed the increase to carbon dioxide released from the burning of fossil fuels. The decrease was due to particulates of dust injected into the atmosphere during the same burning process. He stated, "The ominous possibility that human activities may cause inadvertent climate modification makes the interest in planetary climatology rather important."[71] Sagan referred here to his study of the greenhouse effect on Venus. Using science to study other worlds could help to alleviate global warming on earth.

In 1976, President Ford signed a bill that established the Office of Science and Technology Policy (OSTP) in the Executive Office of the President. The bill authorized the director to take part in science in policy (science influencing policy decisions) and policy for science. It did not, however, create anything resembling PSAC. Even President Jimmy Carter's

[69] Sagan, *Broca's Brain*, 240.
[70] Ibid., 251.
[71] Ibid., 228.

Democratic administration did not consider the reinstallation of PSAC.[72] The Ford and Carter Administrations preoccupied themselves more with solving the general economic recession and less with the place of science in policy.

During this period, Sagan worked on the tangible products of science by taking advantage of funds allocated to NASA through the federal government. He worked on many projects, including the Viking space probes. On September, 5th 1977, NASA launched the two Voyager probes into space. The Voyager probes explored the outer solar system near Jupiter and Uranus. Each contained a gold plated phonograph record that had images, greetings, and sounds of our Earth civilization. Sagan and other scientists designed the record to communicate with extraterrestrial life they might encounter as they left our solar system for the vastness of interstellar space.[73]

Other probes before Voyager held information intended to communicate with extraterrestrial life. Pioneer 10 and 11 contained plaques with visual information concerning Earth civilization. The Voyager team looked to improve upon the Pioneer plaques. They decided to include both visual and audio information embedded within the gold plated discs on the Voyager probes. The Voyager team engaged in a long process of deciding exactly what music the discs would contain. They naturally desired to include western classics like Mozart and Bach, but the team decided that a cross section of music from different human cultures would be best. The Voyager probe held an international, cross-cultural array of information about humans and Earth.

In the book *Murmurs of Earth: The Voyager Interstellar Record* (1978), Sagan spoke of scientific information as the first type of information that a sufficiently advanced spacefaring

[72] Wang, *In Sputnik's…*, 315.
[73] Sagan, *Murmurs of Earth*, preface.

civilization would be able to understand. This is because the laws of physics, chemistry, and astronomy are the same throughout the universe. Extraterrestrial intelligence would come to the same conclusions and observations concerning the basic laws of the cosmos, and this common ground of understanding can be used for communication.[74] The same holds true for basic mathematical principles. Alien civilizations would come to the same conclusions concerning numbers. Two plus two would equal four for any civilization. For this reason, much of the initial information contained within the Voyager discs was arithmetical in nature.[75] Any aliens capable of retrieving Voyager would understand the universal language of science.

Sagan asked the director of the OSTP, Dr. Frank Press, if President Carter would write a message for the Voyager disc. President Carter agreed and his message was sent in visual form on the disc. The President relayed a rather internationalist message to potential extraterrestrials:

> This Voyager spacecraft was constructed by the United States of America. We are a community of 240 million human beings among the more than 4 billion who inhabit the planet Earth. We human beings are still divided into nation states, but these states are rapidly becoming a single global civilization.[76]

It was no coincidence that the President's words of a single global civilization appeared on the Voyager disc. Sagan desired international cooperation through science and space exploration to foster a coherent scientific global civilization. He claimed that the time was now. Either humanity would destroy itself in a nuclear holocaust, or go to the stars and perhaps join the ranks of an interstellar republic: "…there is only one generation privileged to live through that unique transitional moment: that generation is ours."[77] The Drake equation calculated the

[74] Ibid., 5-6.
[75] Ibid., 14.
[76] Ibid., 28.
[77] Sagan, *Broca's Brain*, iv.

statistical number of technical civilizations thought to exist in the galaxy.[78] Sagan took the equation seriously and lobbied the most powerful man on the planet to act as his liaison to the extraterrestrials.

Sagan drew ancient comparisons between mathematics and music, saying that there is a clear connection between mathematical thinking and musical thinking. Physicists and mathematicians often possess musical skills as well. Such was the case with Albert Einstein and his passion for the violin.[79] In his discussion of music and mathematics on the Voyager disc, Sagan commented about the historical origins of this synthesis: "The connection between mathematics and music has been marked at least since the time of Pythagoras."[80] Even in his work sending probes into space to explore the solar system and potentially communicate with extraterrestrial beings, Sagan recognized the ancient origins of science. Sagan's work embodied a continuation of the scientific enterprise that had begun in antiquity and ended in the stars.

As an exobiologist, some of Sagan's work consisted of making informed hypotheses of the potential form and composition of extraterrestrial life. No study could have prepared him for the xenomorphic horrors of the 1979 film *Alien*. Capitalism and science converge on a commercial spacecraft investigating a distress call on an unknown planet. It soon becomes evident that a parasitic extraterrestrial entity with an odd lifecycle stowed away with a member of the crew. Far from practicing Starfleet decorum, the crew's android decides that the research and development potential of the alien outweighs the value of human lives. *Alien* formed a dark critique antithetical to scientism and embodied an artistic expression doubtful of the future of the

[78] The Drake equation is not really an equation, but a formula for roughly calculating the number of extraterrestrial civilizations in the galaxy capable of transmitting information through space.
[79] Sagan, *Murmurs of Earth*, 13.
[80] Ibid.

military-industrial complex.[81] The critique is antithetical to scientism because the film projects a future dominated by science in a horrific light.

In 1981, Ronald Reagan became president of the United States. The "Second Cold War" had begun and the strength of the military-industrial complex returned, although differing in details. Right-wing ideologies (i.e., Reaganomics) questioned the size and the role of the federal government. Instead of a huge reliance upon government funds, policymakers stressed privatization. Emphasis upon privatization meant that corporate America held more political power, something that would ultimately be seen in the 2003 Anglo-American invasion of Iraq. The right-wing ideologues also called for escalated anticommunism. Defense spending increased as a percentage of GDP. More DOD funds found their way to industrial contractors and nonprofit research centers as opposed to universities.[82]

During the 1970's, American faith in science transformed due to the Vietnam War and the environmental movement. Americans wanted more than the military-industrial complex's war and environmental destruction. Within this context, and on the eve of the 'second Cold War,' Sagan starred in the 1980 television miniseries *Cosmos*. Sagan used the series to rekindle American faith and interest in science. The show posited a firmly scientific worldview, placing all of human history within the last second of a cosmic year that represents the time from the big bang to the present (~14 billion years). Sagan discussed star formations, galaxies, evolution, and took advantage of the airtime to warn humanity that they sat at a pivotal moment in history in which they could go to the stars or destroy themselves in a nuclear holocaust. The book version of *Cosmos* (1980), which sold over five million copies, made similar claims and strongly pushed

[81] *Alien*, directed by Ridley Scott (Los Angeles: Twentieth Century Fox, 1979).
[82] Wolfe, *Competing…*, 121-123.

the view that scientific thinking replaced religious thinking as a manner of knowing and should supplant it.

Cosmos: The Progressive History of Science

This section argues that Sagan used his popular work *Cosmos* to advocate a scientific worldview and push a tenant of his scientism—a linear, progressive history of science that undermines religion and superstitious thinking. Part of Sagan's scientific worldview entailed the history of science always being progressive, literally and metaphorically. This is almost certainly propaganda for scientism because thinkers like Thomas Kuhn and Paul Feyerabend have posited episodic and anarchic models of the history of science.[83] Episodic models view the history of science as continuum of stops, starts, and revolutions. Anarchic models view the history of science, and the scientific method, as a chaotic enterprise characterized by failures and accidents. For adherents of scientism, Sagan's popular works could be considered canon law. Despite sentiments of postmodernism in popular culture, Sagan remained a modernist. A postmodern angst bled through, however. Sagan lamented nuclear weapons and global catastrophe. Even positivist scientists were not immune to the underlying fears of the postmodern world. As a modernist existing parallel to critiques of modernity, he sought to direct science in the direction that he perceived as correct. For Sagan, postmodern doubt and weapons of mass destruction held back the wave of progress that began when humans were hunter-gatherers:

> The sky is important. It covers us. It speaks to us. Before the time we found the flame, we would lie back in the dark and look up at all the points of light. Some points would come together to make a picture in the sky. One of us could see the pictures better than the rest. She taught us the star pictures and what names to call them. We would sit around late at night and make up stories about the pictures in the sky: lions, dogs, bears,

[83] Found in: Thomas Kuhn, *Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962) and Paul Feyerabend, *Against Method* (New York: Verso Books, 1972).

> hunterfolk. Other, stranger things. Could they be the pictures of the powerful beings in the sky, the ones who make the storms when angry?[84]

Sagan spoke these words in *Cosmos*, imagining what the world would be like in a hunter-gatherer time before scientific methodology or written language existed. He claimed that humans emerged curiously and looked to the stars for answers. It was the era that spawned myths. Nature acted upon early humans and in turn, humans acted upon nature turning lightning and thunder into gods.

Gerald Holton speculated upon the idea of the cosmos acting upon human beings and humans acting back upon the cosmos by recognizing patterns that they attributed to deities and myth in the book *Thematic Origins of Scientific Thought* (1973). He stated that "Nowhere can one see the persistence of great questions and the obstinacy of certain preselected patterns for defining and solving problems better than in cosmologic speculations."[85] The stars shined their light upon Sagan's hunterfolk in his imaginative passage. In return, the hunterfolk assigned forms to the stars. They speculated upon the nature of the cosmos.

Holton used the concept of *thema* to represent universal ideas within *Thematic Origins*. His thema originally spawned from nature herself as she acted upon humans, and humans responded by recognizing patterns in nature and applying names to phenomena. Sky gods, which prevail in many cultures around the world, can be seen as universal spiritual thema of thunder and lightning anthropomorphized into a powerful male figure. Holton's idea of thema revolve around central themes within nature, such as circularity or symmetry. His book only touched upon the spiritual and mythological origins of thema. The majority of the work focused on thema as they pertain to scientific phenomena.

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[84] Carl Sagan, *Cosmos* (New York: Random House, 1980), 171.
[85] Gerald Holton, *The Thematic Origins of Scientific Thought* (Cambridge: Harvard University Press, 1973), 44.

The importance of thema in regard to Sagan's scientism is how the idea relates to the beginning of human curiosity about the world. In the beginning, science did not exist, only questions that people answered in a mythological manner. In *Cosmos*, Sagan claimed that humans attributed supernatural powers to the phenomena in the sky: "The powerful beings in the sky were promoted to gods." These gods controlled everything from droughts, storms, wars, earthquakes, volcanos and epidemics. They had all of the answers and priests and oracles arose to communicate with the gods.[86]

In speculating about the thoughts of hunter-gatherers, Sagan suggested that the human scientific endeavor began in prehistory. It began when they looked to the stars and began to apply names and universal thema to phenomena in nature that they encountered. Mythological, spiritual thema translated into religious thema and early scientific thema in the works of the ancient Greeks. Holton stated, "We see the thematic component at work from the very beginning, in the sources of cosmogonic ideas later found in Hesiod's *Theogony* and in *Genesis*."[87] For Sagan, science was progress that began in prehistory and continued to the present. By spreading this message, Sagan attempted to break concurrent doubts and illicit faith in the progress of science.

Circularity—organic circular forms found in nature—represents one of the most prominent early examples of a scientific thema and it is found in Aristotle's celestial spheres and Ptolemy's geocentric model of the universe. Ptolemy worked out a geocentric model of the universe using perfect circles. Copernicus preserved the notion of circularity in his heliocentric model. Circularity gave Johannes Kepler a headache when he realized that perfect circular orbits

[86] Sagan, *Cosmos*, 173.
[87] Holton, 44.

of the planets could not be preserved within an accurate mathematical model of the heliocentric universe.

Although explanations about nature first came in the form of mythology and gods, Sagan did not view mythological notions in a positive light and preferred a purely scientific standpoint. He stated that for thousands of years before the glory ages of Greece "humans were oppressed—as some of us still are—by the notion that the universe is a marionette whose strings are pulled by a God or gods, unseen and inscrutable."[88] To Sagan, blind religion was the darkness. Science and empirical thought were the light. The ancient Greek revolution "made Cosmos out of Chaos."[89] Greece gave birth to the first children of a scientific worldview.

Sagan discussed his position concerning religion and humankind's place within the universe in *Cosmos*. He declared that science began on the ancient Greek Ionian islands between 600 and 400 BC. There, one of the last Ionian scientists, Aristarchus, posited the first heliocentric model of the universe. "Since Aristarchus, every step in our quest has moved us farther from center stage in the cosmic drama." Some people viewed this as a negative thing. They would prefer a world in which human beings play a more central role. Sagan demanded that if human beings are to really understand the world, they must first understand their position within the cosmos, however non-central or non-pivotal that position may be.[90] Only science can give this understanding.

Sagan lauded the ancient Ionians for their genius. He characterized them as an industrious, mechanical, artisan people with a proclivity towards thought. They "rejected superstition." Sagan announced that ancient Ionia gave birth to scientific culture by stating that

[88] Sagan, *Cosmos*, 174.
[89] Ibid., 175.
[90] Ibid., 193.

the Ionians were "the truest pioneers in the development of our civilization and our humanity."[91] He thus claimed a continuity between the science of ancient Ionia and of our global scientific culture today, underlining his belief in the progress of science. He also insinuated that science alone, devoid of superstition, gave us our civilization and our humanity. The belief in science's power to civilize, humanize, and answer all questions epitomizes pure scientism, and this is the belief that Sagan communicated.

Sagan speculated as to why such a place would birth science. Ionia is a land of islands and beaches off of the coast of Asia Minor. Many forms of government (i.e., oligarchy, monarchy) and political authority permeated the archipelago during the time of Aristarchus. No single regime exerted homogenous ideas over the entire region. Many different forms of thought existed. Furthermore, the region lies at the crossroads of civilization. Sagan alluded to the cross-fertilization of ideas between the Greek speakers and the Babylonians. The Ionian scientist Thales "had travelled in Egypt and was conversant in the knowledge of Babylon." He "brought back from Babylon and Egypt the seeds of the new sciences…"[92] Ionia gave birth to science because of its location at the intersection of cultures.

Sagan's thoughts concerning the cross-fertilization of ideas between a Greek-speaking Ionian world and Babylon and Egypt resemble an idea posited by Derek de Solla Price in his book *Science since Babylon* (1961). Price argued that science emerged as a meshing between Greek geometrical and pictorial thinking, and Babylonian quantitative and numerical thinking. According to Price, these two modes of thinking eventually converged in Ptolemy's *Almagest* in

[91] Ibid., 176.
[92] Ibid., 176-77.

the second century. The *Almagest* provides both a geometrical and quantitative model of the motions of the planets within a geocentric model.[93]

The Greeks knew well the circular motions of the planets and already adhered to the thema of circularity. The Babylonians possessed detailed numerical observations, but few pictorial conceptions. Price claimed that the complementary nature of these two understandings produced an unprecedented advancement in physics and astronomy. He used China as an example of an early scientific culture which contained both visual and quantitative elements, but lacked the complementary blending of the two different thought processes.[94]

Price suggested that a psychological element played out between the Greek visual style and the Babylonian mathematical style. He posited that the Greek visual style was right-brained and artistic while the Babylonian style was left-brained and logical. Price questioned whether or not entire civilizations could follow a left or right brained manner of thinking. He likened the artful intuitive lines of the Parthenon to the Greeks and the analytical cuneiform symbolism to the Babylonians.[95] For Sagan and Price, a historical synthesis of two lines of scientific thinking merged into the progressive line of science to create a powerful tool capable of creating a predictable model of the known universe.

A progressive history of science ultimately came with a cost—weapons of mass destruction. The ancient Greeks had triremes, the moderns have nuclear submarines. In *Cosmos*, Sagan pleaded with his readers that they leave their primitive, reptilian brain behind. The base of the brain—the reptilian complex—contains primal violent, and sexual desires. It is the driving force of reptiles, amphibians, fish and other animals that act upon pure instinct. It is this part of

[93] Derek de Solla Price, *Science since Babylon* (New Haven: Yale University Press, 1978), 17.
[94] Ibid., 15-16.
[95] Ibid., 22-23.

the brain that drives us to kill one another thoughtlessly. Our more developed cortex and frontal lobe allows us to make rational, conscious choices. Sagan asked, can we leave this part of ourselves in the past and consciously make a decision not to annihilate one another in a nuclear holocaust?[96] Sagan blamed something other than science for the violent weapons—the primordial human spirit.

Negotiating the Cold War's End: Scientism in the Late Twentieth Century

This section argues that Sagan utilized the conditions of the post-Cold War world to continue to push a scientific worldview through popular works. As the Cold War came to an end, Sagan's planetary studies connected with his fear of nuclear war. A puzzling temperature discrepancy on the surface of Mars prompted Sagan and a team of scientists to investigate why. Dust in the Martian atmosphere caused a difference in the theorized and actual temperature. The team wondered if dust from nuclear explosions on earth could cause a similar temperature change. It led them to discover nuclear winter and alter the course of the Cold War to a certain extent. Sagan and the TTAPS team used planetary science to uncover nuclear winter. Sagan's scientism retained the same elements, but when the Cold War ended, Sagan could no longer use Cold War rhetoric to frame his scientism. Instead, he used the legacy of the Cold War to reiterate his warnings, reaffirm his scientism, and suggest space travel and exploration as a means to combat the continuing threats that humanity faced.

President Reagan feared nuclear holocaust, but rejected the idea of mutually assured destruction. He preferred that the United States adopt a defensive strategy.[97] Despite extreme skepticism expressed by the scientific community, in 1983, President Reagan announced the

[96] Sagan, *Cosmos*, 326.
[97] Wolfe, *Competing…*, 128.

Strategic Defense Initiative (SDI), popularly known as Star Wars. The system called for space-based lasers that would shoot down incoming Soviet ICBMs. In 1984, the Strategic Defense Initiative Organization received 1.4 billion dollars in funding.[98]

During the Halloween of 1983, a group of 200 scientists from around the globe held The Conference on the Long-Term Worldwide Biological Consequences of Nuclear War in Washington, D.C. to discuss the findings of the TTAPS study. In 1984, Carl Sagan, Paul Ehrlich, Donald Kennedy, and Walter Orr Roberts published a record of the conference in a book entitled *The Cold and the Dark: The World after Nuclear War*. The book brought to the public the results of the TTAPS study which concluded that a nuclear exchange of at least 100 megatons could bring about a "nuclear winter" that would make the world cold and dark for a period of a few months to a few years. In the first section, *The Atmospheric and Climatic Consequences of Nuclear War,* Sagan explained in great detail the study's findings concerning several varying nuclear war scenarios. The study concluded that as little as 100 megatons, less than one percent of the world's stockpile of nuclear weapons at the time, detonated over urban areas would be sufficient to initiate a nuclear winter. Sagan exercised caution in clarifying that the 100 megaton threshold only applied if weapons were detonated over urban areas (urban areas contain large amounts of combustible material), but stressed the fact that 100 megatons represented only a small portion of the world's nuclear arms and that in the event of an actual exchange, thousands of megatons of armament would probably be used against both urban and military targets in non-urban settings.[99]

In the second section, *The Biological Consequences of Nuclear War,* Dr. Paul R. Ehrlich described what would most likely occur to the Earth's biosphere and varying ecosystems as the

[98] Ibid., 131-132.
[99] Carl Sagan et al., *The Cold and the Dark* (New York: Norton, 1985), 3-39.

result of a nuclear war. Ehrlich made clear that the Earth is more or less one large ecosystem and that a nuclear exchange would affect the entire planet. The first negative biological effects following the destruction of immediate blasts would come from radiation and nuclear fallout. The effects of the cold and the dark of nuclear winter would come next. The sun would be blocked out by dust and debris, global temperatures would drop, many plants would freeze, and most others would halt the process of photosynthesis without sunlight. Without plants, the base of the food chain would be destroyed and many animals would starve. Nuclear blasts of that magnitude would create large amounts of nitrous oxides that would destroy the ozone layer. Creatures that were not killed or driven to extinction from nuclear radiation and starvation from the deprivations of nuclear winter would have to face toxic UVB radiation from the sun once the dust clouds cleared.[100] Ehrlich concluded that a nuclear war would be so devastating that "if the atmospheric effects did spread over the entire planet, then we cannot be sure that Homo sapiens would survive."[101] The authors consciously decided to avoid discussing policy implications and brought to light only the facts of the study.

Regardless of the authors' intentions to avoid policy implications, the TTAPS scientists might have influenced policy anyway. In 1985, President Reagan stated:

> A great many reputable scientists are telling us that such a [nuclear] war could just end up in no victory for anyone because we would wipe out the Earth as we know it. And if you think back to a couple of natural calamities—back in the last century, in the 1800's, just natural phenomena from earthquakes, or, I mean, volcanoes—we saw the weather so changed that there was snow in July in many temperate countries. And they called it "the year in which there was no summer." Now if one volcano can do that, what are we talking about with the whole nuclear exchange, the nuclear winter that scientists have been talking about?[102]

[100] Ibid., 43-71.
[101] Ibid., 62.
[102] Carl Sagan and Richard Turco, *A Path Where No Man Thought* (New York: Random House, 1990), 185.

According to Sagan, he influenced Reagan's statement and he and his colleagues published a popular book that openly said so. In 1987, President Reagan and Soviet General Secretary Mikhail Gorbachev signed the Intermediate-Range Nuclear Forces Treaty (INF). The treaty eliminated many intermediate range nuclear weapons. Sagan did not just push scientism in his books, he boasted about science's political leverage.

Six years after the publication of *The Cold and the Dark*, Carl Sagan and Richard Turco published *A Path Where No Man Thought: Nuclear Winter and the End of the Arms Race* (1990). The book was a continuation of the previous publication that made use of more recent research and went into depth on the specifics of nuclear winter, poison gas, fallout, and ultraviolet light. Whereas the previous book avoided discussing policy issues regarding nuclear winter, the newer book discussed them in some detail. It began with a parable from ancient Greece in which Croesus, the King of Lydia, approached the Oracle at Delphi to ask whether or not he should invade Persia. The Oracle replied that if he did, a great empire would be destroyed. Croesus understood it in terms of Persian destruction, invaded Persia, and lost miserably, becoming himself a vassal of the Persian Emperor's court. The authors' used the story to illustrate that policy makers need to consult modern oracles—scientists—to derive all of the facts and not just those that they wish to use to their own ends.[103] If they fail in this, they will be guilty of hubris and it could cause their own destruction. The authors' reference to scientists as modern oracles again underlines Sagan's adherence to a strict scientism—scientists are likened to all-knowing gods. Politicians should consult scientists for scientific solutions to scientific problems. In much the same manner that kings of the past consulted polytheistic oracles, priests, or adhered to the Christian worldview, the authors insisted that modern kings should consult the scientific priestly

[103] Ibid., 11-13.

class and adhere to the scientific worldview. Only science could give the answers to scientific problems.

The book also discussed the reaction of policymakers from around the world. For instance, The Delhi Declaration of 1985 by the heads of government of several nations (India, Sweden, Tanzania, Mexico, Argentina, and Greece) said that nuclear winter was "posing unprecedented peril to all nations, even those far removed from the nuclear explosions."[104] The authors even laid out a near-term plan of what the United States should do concerning nuclear policy. In short, their policy called for a reduction in nuclear weapons, a reduction in spending on delivery system technologies (missiles, submarines, aircraft), stronger negotiations with the Soviet Union, and a shifting of resources and funds to combat other worldwide dilemmas such as global warming and the AIDS pandemic.[105] The book concluded that "From the halls of high Olympus, where strange dooms are stored for humans, there is reason to hope that, in our time also, there is a way out—a path where no man thought."[106] This path begins when the halls of policy consult modern oracles—scientists.

In 1989, the Berlin Wall fell. In 1990, President George H.W. Bush and coalition forces routed the Iraqi armies of Dictator Saddam Hussein from Kuwait. In late 1991, a failed coup to topple Secretary Gorbachev and his campaigns of openness and reform caused the Supreme Soviet to vote itself out of existence. The former republics of the USSR united under the Commonwealth of Independent States (CIS) for mutual military and economic support. The CIS possessed very little executive or central control and Russia became the political successor to the Soviet Union and the de facto leader of the CIS, although not all former republics agreed to all

[104] Ibid., 179.
[105] Ibid., 277-281.
[106] Ibid., 301.

CIS protocol or acceded readily to Russian leadership. The United States won the Cold War and asserted a position of authority in the Middle East. Russia still possessed thousands of nuclear weapons and a strong conventional military, however.

After the fall of the Soviet Union, Carl Sagan and Ann Druyan published *Shadows of Forgotten Ancestors* (1992). The authors told the story of humankind's evolutionary past beginning with the emergence of life on Earth billions of years ago. They explained the structure of the genetic code and how changes from billions of years ago still affect human behavior today. Evolution allowed the rise of a technical civilization on planet earth. The book stated that although humans created Earth-changing technologies that allowed them to venture into space, these same technologies cause the extinction of certain species in the biosphere and could potentially end human life altogether.[107] It warned that even though the Cold War was over, dangers persisted— resurgent nationalism, inept leaders, environmental decay, inadequate education, and increasing population.[108]

A world with science has dangers, but Plato's cave may be darker:

> And now, I said, let me show in a figure how far our nature is enlightened or unenlightened: Behold! Human beings living in an underground den, which has a mouth open towards the light and reaching all along the den; here they have been from their childhood, and have their legs and necks chained so that they cannot move, and can only see before them, being prevented by the chains from turning round their heads.[109]

Plato's cave cast darkness. Science was Sagan's candle in the dark. The flickering shadows, shapes, and apparitions represent the superstitions that sought to portray the truth. The cave embodies the blind human condition that attempts to explain the world through myth. For Sagan, science was the process by which individuals and humanity as a whole unchained

[107] Carl Sagan and Ann Druyan, *Shadows of Forgotten Ancestors* (New York: Ballantine Books, 1992), 1, 412.
[108] Ibid., xiv.
[109] Plato, *Republic*, ed. Benjamin Jowett (New York: Barnes and Noble, 2004), 224.

themselves from the wall of the cave. It did not matter that the products of science had caused two world wars, killed millions of people, and created tens of thousands of nuclear weapons. The cave was darker and for Sagan there was truth, there was progress, and there was victory. Victory entailed overturning superstition, bad government, and doubts about human progress.

In 1993, Bill Clinton became the president and assumed responsibility of the nation's direction. As a post-Cold War president, Clinton lacked the ability to use anti-Soviet rhetoric to materialize support in an effort to combat global crises. The situation required a new narrative of framing international events. Clinton soon came under scrutiny as the office of the president's unilateral definition of events evaporated with the lack of an opposing superpower—the president could no longer immediately define occurrences as a product of the Cold War. Clinton's first challenges consisted of the presence of a military regime in Haiti following a 1991 coup to overthrow the democratically elected president and the potential proliferation of nuclear weapons in North Korea, neither of which could be framed in the context of the Cold War.[110] Situations became more dynamic and less of a black and white issue between east and west.

Sagan could no longer frame his arguments within the environment of the Cold War either, only within the legacy of the Cold War. In 1994, the dangers consisted of the persistence of the American and Russian arsenals, environmental issues, and the specter of reemerging nationalism as opposed to an active arms race (arms were still produced and sold, however). In the New York Times bestseller *Pale Blue Dot: A Vision of the Human Future in Space* (1994), Sagan claimed that space exploration nurtures interdisciplinary thinking that will enable people to combat ensuing environmental disasters. Furthermore, space exploration tears down the walls of nationalism between people by encouraging mutual cooperation. Sagan stated that "it seems

[110] Jim A. Kuypers, *Presidential Crisis Rhetoric and the Press in the Post-Cold War World* (Westport: Praeger Publishers, 1997), 3.

to me that planetary exploration is of the most practical and urgent utility for us here on Earth."[111] For biological reasons human beings need new frontiers. These new frontiers would revitalize humanity and carry them into the future.[112] Sagan reiterated his argument concerning space colonization and human survival. In light of earthly problems still extant in the post-Cold War world, he urged that "we vastly increase our knowledge of the Solar System and then begin to settle other worlds."[113]

In the book *The Demon-Haunted World* (1996), Sagan's eighth New York Times bestseller, he reiterated his scientism and his disdain for the superstitious. He explained how a sixteenth century English work called *A Candle in the Dark* denounced witch hunts as a scam to trick people. Modern science gave answers to phenomena that women were hanged for just centuries ago.[114] It was a liberating force. Sagan then claimed that the history of science is "by far the most successful claim to knowledge accessible to humans." This statement exemplifies Sagan's strong adherence to a scientific worldview and the manner that he communicated it to the public. The history of science has been characterized by successive attempts to understand the universe. Science examines the world critically, skeptically, and mistrusts authority. It is the best system of understanding that humans possess, but it can exhibit negative side effects. In fact, Sagan warned of the ills of science in a society that does not understand it. He feared that the level of science and technology might surpass the understanding of the common citizen. This would be a dangerous mixture.[115] Superstition is dangerous, but so is the misuse of science. Only the wise use of science coupled with keen skepticism could ultimately liberate mankind.

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[111] Carl Sagan, *Pale Blue Dot* (New York: Ballantine Books, 1994), 182-183.
[112] Ibid., 230-231.
[113] Ibid., 312.
[114] Carl Sagan, *The Demon-Haunted World* (New York: Random House, 1996), 26.
[115] Ibid.

This may be something difficult to achieve in a world of global corporations and arms dealers where self-interests reign supreme.

In 1994, doctors diagnosed Sagan with a disease called myelodysplasia—a disease of the blood characterized by an underproduction of myeloid blood cells. In 1996, he died after two years of fighting. His wife, Ann Druyan, relates that contrary to rumor, Sagan underwent no religious conversion during his last hours. He remained true to his principles. "Carl was unflinching," Druyan writes. He never turned away from the reality of his situation. "For Carl, what mattered most was what was true, not merely what would make us feel better."[116] Sagan was 62.

Documents from the Bill Clinton Presidential Library suggest that the administration considered posthumously awarding Sagan the Presidential Medal of Freedom. Memos between staff suggest Sagan as a potential candidate. One staffer wrote, "...I neglected to include another possible posthumous awardee, Carl Sagan." In reply another staffer said, "You know, he was one of the very first to sound the warning on climate as well."[117] The administration never gave Sagan the award, however.

Billions and Billions (1997) was released shortly after Sagan's death. It started off lightheartedly enough— Sagan said that he never actually uttered the words "billions and billions" as such. The media falsely projected the saying based on the way he said the word "billion" in the *Cosmos* television series. The book itself presented heavier warnings, however. Sagan warned of over-population, global warming, a scientifically illiterate society, and nuclear war.

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[116] Carl Sagan, *Billions and Billions* (New York: Random House, 1997), 270-271.
[117] William J. Clinton Presidential Library, "FOIA 2006-1879-f-Carl Sagan," accessed May 1, 2014, http://www.clintonlibrary.gov/assets/storage/Research%20-%20Digital%20Library/formerlywithheld/batch2/2006-1879-F.pdf.

His talk about billions and billions soon turned into a conversation about over-population. For the majority of time that the human species inhabited Earth, their population remained steady. The agricultural revolution changed things. As humans began to produce more food, they could sustain larger populations and sedentary towns. Now, populations grow at an exponential rate. Sagan explained that no easy solution exists; no amount of technological advancement could defeat exponential population growth.

Sagan also explained the correlation between population growth and poverty. In poverty stricken countries, birthrates are higher. A demographic transition has to take place before population rates begin to even out. Sagan argued that humankind has a responsibility to flatten out exponential rates of population growth "by eliminating grinding poverty, making safe and effective birth control methods widely available, and extending real political power to women." Sagan suggested that if humans did not take steps to alleviate poverty and stunt population growth, something else might solve the problem for us—nuclear war.[118]

Nuclear war is a "lose-lose" proposition.[119] Sagan described nuclear weapons as technological triumphs that "advanced the art of mass murder by a factor of a thousand." From the time of Gettysburg to the era of hydrogen bombs, human explosive weapons have become a billion times more deadly. After WWII, both the United States and the Soviet Union engaged in an arms race that made them ever more vulnerable to one another. Both spent massive amounts of money and resources building nuclear weapons and developing the means to deliver them to any location on the Earth.[120]

[118] Sagan, *Billions and Billions*, 16-18.
[119] Ibid., 187.
[120] Ibid., 194-195.

Sagan gave a chilling warning concerning the future of the 60,000 nuclear weapons that the United States and Soviet Union built. The twentieth century had been the century of Hitler and Stalin and the world had seen what madmen could do with the power of industrialized states. Chernobyl and the *Challenger* incidents were accidents that the "experts" said never could happen. By referring to the accidents, Sagan shed light on the possibility of accidents with nuclear weapons. If both the United States and Russia do not act to diminish their nuclear stockpiles, there could be vile consequences in the future. Each nation would have to put trust in their leaders that none of them would ever use these weapons. That trust would not just apply to the United States and Russia, but to all nations that possess nuclear arms. This trust would have to extend indefinitely into the future. That, Sagan insisted, was too much to ask—there would be the misuse of nuclear weapons in the future if humans do not take measures to get rid of them.[121] Despite the end of the Cold War, the legacy of the Cold War posed just as much danger for future generations.

To a certain extent, Sagan shifted the blame of nuclear weapons from science itself to the mismanagement of science, and to bad leadership. After WWII, the leaders of the United States and the Soviet Union made the wrong decision in deciding to pursue a stockpile of atomic bombs. The United States spent ten trillion dollars on its confrontation with the Soviet Union between the end of WWII and the end of the Cold War. Sagan pointed out that instead of spending this money on scientific products of death, it could have been spent on scientific and social projects of benevolence and exploration. Vast amounts of money could have been spent combating disease, poverty, illiteracy, and safeguarding the environment. An international manned mission to Mars could have been mounted. Had the United States and the Soviet Union

[121] Ibid., 196.

acted differently, "The Technological and entrepreneurial opportunities would have been prodigious."[122]

Even in the face of nuclear war, Sagan remained a proponent of the progress of science. He blamed bad governments for the ill products—weapons of mass destruction. The time, energy, and money could have been spent on the more positive fruits of science: the technology of medicine, exploration, and global environmental conservation. Sagan never rejected science, only the mismanagement of science.

In 1997, Sagan's 1985 science fiction novel *Contact* was adapted into a film of the same name. Jodie Foster starred as Dr. Arroway—a vivacious, outspoken astronomer who appears in many ways to be a blonde female version of Sagan. While on a trip to the Arecibo Observatory in Costa Rica, Ellie meets a dashing man of Christian faith named Palmer Joss. She is forced to cut the love affair short when the NSF cuts her research funding. Ellie then seeks out private funds from Hadden Industries to work at the large array in New Mexico. Not long into her research, Ellie discovers extraterrestrial transmissions from a star system 25 light years away. Embedded within the transmission are plans to build an interstellar transport device. Immediately, the Clinton administration and the military take over the project. Sagan's female alter ego causes President Clinton to hold a press conference discussing her findings. The device is built, but destroyed by religious fanatics in a bombing. The dark industrial tycoon Mr. Hadden soon contacts Ellie to inform her that his company built a second device in Hokkaido, Japan. Ellie reencounters Father Joss who reluctantly assents to her taking a voyage within the device. Ellie embarks, apparently through a wormhole to a distant part of the universe, but to observers at mission control the device has malfunctioned. A congressional hearing concludes that Mr.

[122] Ibid., 197.

Hadden orchestrated the entire affair as an elaborate prank. At the end of the movie, however, it becomes obvious that the national security advisor has covered up evidence to support that Ellie did indeed travel to a far flung area of the universe.[123]

Contact presents a modernist science fiction critique in the face of religion and political forces that seek to derail endeavors like SETI. Throughout the story, elements of NSF, the government, and religious groups seek to undermine Ellie and her quest to find extraterrestrial intelligence. The tale seems strikingly autobiographical for anyone acquainted with Sagan's work, despite the fact that Ellie is a female. This should not be surprising though, because Sagan filled his books with an underlying feminism that insisted that women should be equal partners to men, especially in scientific undertakings. Ellie's love affair with a religious man represents the friction between science and faith experienced in Sagan's own life.

Ann Druyan edited Sagan's 1985 Gifford lectures on theology and science and released them in the book *The Varieties of Scientific Experience* (2006). The work mirrors the Gifford lectures on theology given by William James and published as *The Varieties of Religious Experience* (1902). In Sagan's lectures, he argued that science and religion both seek to answer the same kinds of questions. The difference lies in the method by which they attempt to answer them. Sagan said that superstition "is merely belief without evidence."[124] Humans have a natural tendency to apply anthropomorphic ideas and common experience to most phenomena. Humans created gods and then gods or spirits animated everything. Sagan insisted that solid evidence never laid the groundwork for this process. It was pure superstition. He argued that the history of science "has been in part the tension between the natural tendency to project our

[123] *Contact*, directed by Robert Zemeckis (Burbank: Warner Bros. Pictures, 1997).
[124] Carl Sagan, *The Varieties of Scientific Experience* (New York: Penguin, 2006), 1.

everyday experience on the universe and the universe's noncompliance with this human tendency."[125] Only science could discover the truth and undermine false projections, not religion.

Sagan placed spiritual, religious thema into the dark realm of Plato's cave. Only concrete observational data represents the light. The light came in steps. It was a progression. As science progressed there were "a series of assaults on human vainglory." Anthropocentric human myths were slowly uprooted and destroyed. Several instances undermined a human-centered, mythological understanding. The Copernican heliocentric model displaced human's position in the universe from the center to somewhere on the periphery. The fact that the Earth is much older than human history disrupted human's prominent place in time. Charles Darwin's discovery of the theory of evolution displaced human's position atop the hierarchy of other animals. Gods no longer ordained humans as the masters of other creatures. They simply evolved alongside all of the other forms of life, and were subject to the same laws of natural selection. [126] A belief in the progress of science featured prominently in the scientific worldview and Sagan sought to share this belief through his popular works.

The Varieties of Scientific Experience represented Sagan's personal view of the search for God. It argued that the history of science is characterized by successive steps of debunking myths and anthropomorphic ideas. Concrete observations and empirical conclusions replaced these myths. Examples of scientific experience fill the pages. Each chapter contains images of scientific sketches and photographs. These images contain the material, non-superstitious evidence of the world and of "God." For Sagan, if God existed, this being resided in the cosmos: "By far the best way I know to engage the religious sensibility, the sense of awe, is to look up on

[125] Ibid., 35.
[126] Ibid., 39.

a clear night."[127] This spiritual engagement with the Cosmos best depicts Sagan's agnosticism and how he wished to share his contemplations with the world. In 1996, an interviewer asked Sagan about his religious beliefs and he responded that he was agnostic.[128] The truth of Sagan's spirituality is far more complicated, however. During his life, he pushed with all his might to share that spirituality of the cosmos by strongly advocating a human space-based scientific culture devoid of ancient superstition, war, and religion.

Conclusion

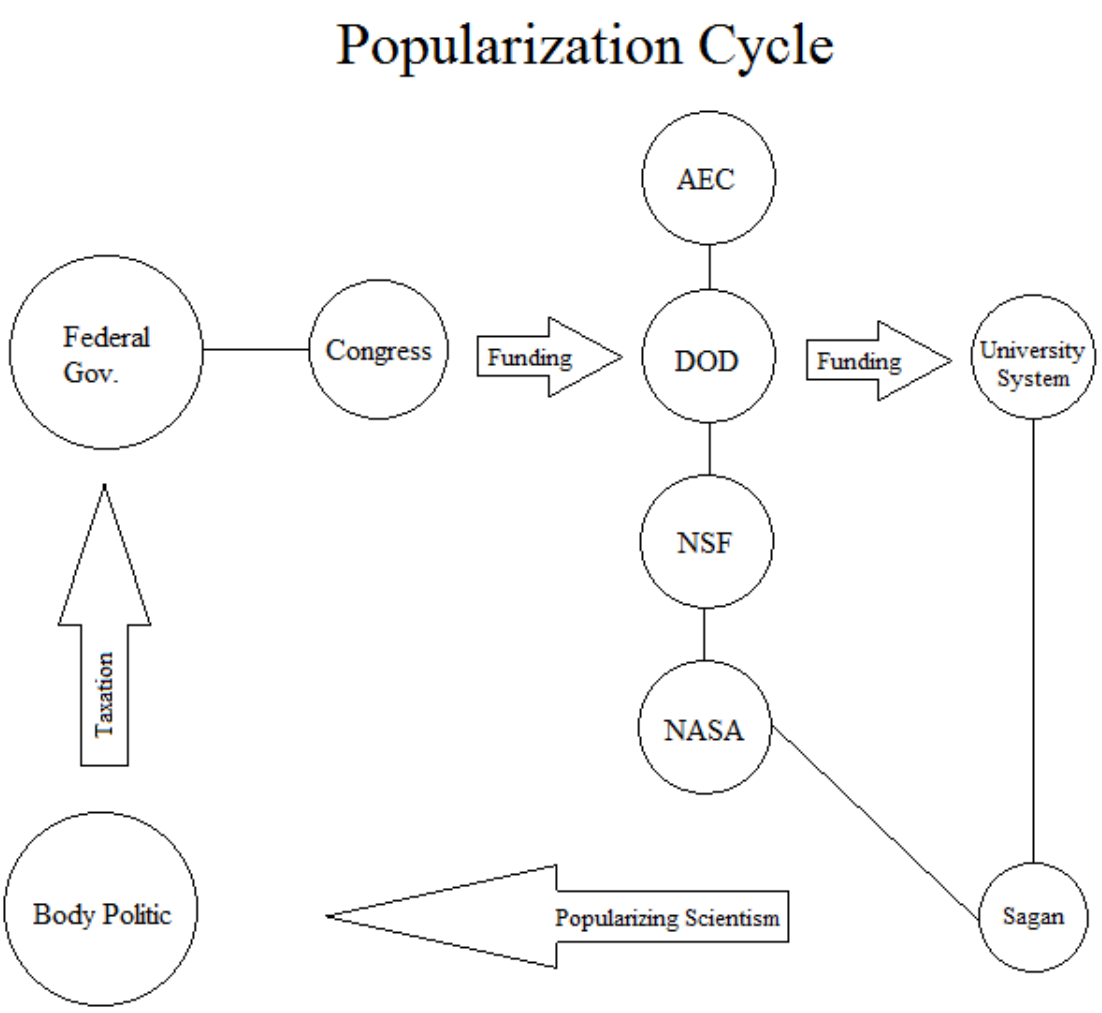
Sagan's scientific adventure began when hunter-gatherers roamed the Earth and began contemplating the cosmos. He was a continuation of their journey that ended in the stars and a strong proponent of continued space exploration and the search for extraterrestrial life. Much of his life and his work sat at the intersection of science and the military-academic-industrial complex of the Cold War. Science fiction writers influenced some of his work. Some of Sagan's work influenced the office of the United States president. Sagan utilized the rhetoric of the Cold War to influence the public in much the same manner that the Presidents of the United States used Cold War rhetoric to frame presidential decisions. When the Cold War ended, Sagan could only frame his scientism in the legacy of the Cold War. Instead of warning of the imminent danger posed by the superpowers, he warned of the future of the 60,000 weapons. He warned of global warming and over-population. If the Soviet-American conflict did not push humanity to a scientific culture in space, the legacy of the twentieth century would. Both during and after the Cold War, Sagan stressed cooperation between nations. During the Cold War, he wrote a book with a Soviet scientist and stressed Soviet-American cooperation in space

[127] Ibid., 2.
[128] Head, *Conversations…*, xiv.

exploration as a means to avoid destruction. After the Cold War, Sagan insisted that space exploration was a means to advance international cooperation, avoid resurgent nationalism, and insure human survival in the future.

Throughout Sagan's popular works, he supported an agnostic worldview that claimed that science began in prehistory as humans asked mythological questions. This continued until the debunking of myth in ancient Ionia that continued to the present in the form of science. The Ionians created the scientific method. This progress through the scientific method embodied the best way of knowing about the universe. It is a basic tenant of Sagan's scientism that science progressed literally and metaphorically in this manner, and not sporadically, as historical accident, or propaganda. Sagan spread this version of the history of science to the public in *Cosmos*. He also spoke of the dangers of a scientifically illiterate public and attempted to educate them by pushing his version of scientism while simultaneously warning of the dangers of nuclear weapons, global warming, and overpopulation. Even as a positivistic scientist, the postmodern world haunted Sagan. Science was never to blame, however, only the mismanagement of science by the Cold War powers. And Sagan used both the direct conflict of the Cold War and its aftermath to push an agnostic space-based scientific culture.

The science-driven culture of the military-industrial complex that emerged after World War II exacerbated already extant problems associated with industrialization—global warming and overpopulation. The war and the subsequent Cold War added the threat of multiple nuclear weapons. Science and technology drove society in the post-World War II world. Sagan's activities as a scientist and a popularizer within this culture suggest the pattern below:



In this model, the university system and NASA—two federally funded entities that make up part of the military-academic-industrial complex—employed Sagan while he concurrently wrote books that pushed a scientific worldview. Books and television influence culture and are a part of culture. Sagan's popular science works contributed to overall American and world culture. Their popularity will be measured further in a section below.

Stephen Hawking: Scientism's Jedi Knight

Introduction

This chapter argues that Stephen Hawking, following in the footsteps of Sagan, added a radicalization to the scientism sold through popular science works. Responding to Sagan's antireligious precedents and his own work on black holes, Hawking became the first popularizer in the thread to posit that science may show that the universe does not need God to exist. Hawking further pushed the agenda of scientism by claiming that philosophy is dead. His scientism was characterized by atheism, advocation of space exploration, and a progressive history of science. A raw cross-section of these tenants drawn directly from Hawking's popular works will be shown here as evidence that Hawking used popular science works to push a scientific worldview.

Stephen Hawking was born in Oxford, England, in 1942, exactly three hundred years to the day after Galileo died. His family lived in London, but sought refuge in Oxford during the German bombing of England. Hawking had two sisters and an adopted brother. As a child, Hawking played with train sets. He read the bible with a tutor and attended St. Albans school during his adolescence. Hawking attended Oxford as an undergraduate and Cambridge as a graduate student where he was friends with Brandon Carter, the man who developed the anthropic principle. At Cambridge doctors diagnosed Hawking with Amyotrophic Lateral Sclerosis (ALS). Around the same time he met Jane Wilde, his future wife with whom he would have children. Hawking received his PhD in 1966. He began work on black holes in 1970. He soon discovered that black holes emit radiation, now known as Hawking radiation. One of his

first jobs was at Caltech in Pasadena, California where he lived with his wife Jane until 1975 when the couple moved back to Cambridge.[129]

Hawking began his career as a public intellectual shortly before the fall of the Soviet Union and the rise of the internet-driven information age. Hawking wrote in a godless irreverent manner that cut to the core. Similar to Sagan, he renounced the concept of God as an outdated myth and proposed that modern science made religion obsolete. Hawking took things a step further, however, and announced that the universe needed no creator to exist and that even philosophy was obsolete in the late twentieth century. He therefore radicalized scientism by denouncing God and other ways of knowing. It is a radicalization because Sagan only questioned God and suggested that the scientific method was the best manner of knowing. Throughout Hawking's works he credited the scientists of the past, from ancient Ionia to the present, for continuing the scientific enterprise. Hawking insisted that the public understand science so that they might be able to put pressure on world governments to face the extant problems of the post-Cold War world—nuclear weapons, global warming, and overpopulation. Despite the obstacles that humanity faced, and his own struggles with ALS, Hawking's optimism drew the attention of the President Barrack Obama.

A Scientist Meets the Machines

This section argues that Hawking, under the influence of Sagan, added a radicalization to late twentieth century scientism by positing that science may show that the universe does not require God to exist. This section also claims that the rise of the information age catalyzed the emerging scientism movement. Hawking's first popular book, *A Brief History of Time* (1988),

[129] Stephen Hawking, *My Brief History* (New York: Bantam, 2013).

built a progressive history of science and suggested that advances in scientific understanding preclude the need for God. The book, released during the technological boom of the 1980s, initiated Hawking's foray into the advocation of scientism. By that time, Cold War competition between the superpowers had spawned a global satellite network. Personal computers debuted and small office networks emerged to intertwine their CPUs. Soon, the Cold War ended and different networks linked together using the internet backbone of the military-academic-industrial complex. It all began with the speculation of a science fiction writer.

The science fiction writer Arthur C. Clarke wrote an editorial in the February 1945 edition of *Wireless World*. The editorial suggested using German V2 rocket technology in the postwar world as a means to launch a global satellite communications network. Clarke, then a member of the British Interplanetary Society, stated that an "artificial satellite" system "could give television and microwave coverage to the entire planet." He concluded that it was the "ultimate solution" to the problem of peacetime uses for the V2.[130] Clarke did not envision a global network of intercontinental ballistic missiles based on V2 technology, however.

A global satellite network would be built, but postwar powers also built a network of a differing sort. In 1957, "Sputnik's Shadow" led to more than a reorientation of science in policy; it ultimately led to the information age. As a response to the Soviet satellite launch, President Eisenhower created PSAC for science in policy. In 1958, he created the Advanced Research Projects Agency (ARPA) under the jurisdiction of the DOD. One of the first projects that ARPA undertook was the creation of the ARPANET. In 1962, an MIT professor working for ARPA named J.C.R. Licklider published a paper that foresaw a network of computers that allowed access from anywhere in the world.[131] Just seven years later, in 1969, ARPANET became

[130] Arthur C. Clarke, "V2 for Ionosphere Research?," *Wireless World*, February 1945.
[131] Kevin Hillstrom, *Defining Moments: The Internet Revolution* (Detroit: Omnigraphics, 2005), 6.

operational with four nodes—UCLA, Stanford Research Institute, the University of Utah, and the University of California. By 1971, the network added fifteen more nodes, one of them at NASA.[132] The ARPANET acted as the computer communications network of the military-academic-industrial complex.

The Cold War spurred the invention of ARPANET and the DOD managed it. The United States and the Soviet Union researched hair-trigger launching systems for their ICBMs. They needed a more reliable communications network. The decentralization of a computer network proved ideal because part of the network could be destroyed while the rest of it remained functional. Computer engineers designed package switching techniques to communicate across the network for military uses.[133]

In 1979, the NSF built the NSFnet as a means for scientists like Hawking to communicate via a computer network. The NSFnet used the backbone of the ARPNET. Because of quasi-public access to NSFnet through university terminals, the United States military created a devoted military network called MILNET in 1983. During the technological boom of the 1980s, computer companies released personal computers. Local area networks found their way to business settings throughout the world. As the Cold War ended, the government loosened control on the internet. In 1990, ARPANET was decommissioned and the NSFnet became the internet.[134] In 1992, after the definitive fall of the Soviet Union, Senator Al Gore pressed legislation through that transferred control of government networks from the NSF to private interests. Local area networks connected to the internet backbone via internet service providers. The commercial internet was born.[135]

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[132] Ibid., 12.
[133] Janet Abbate, *Inventing the Internet* (Cambridge: MIT Press, 1999), 10-11.
[134] Hillstrom, *Defining Moments…*, 12.
[135] Ibid., 47.

Late twentieth century scientism—in which Hawking was a key player—emerged in parallel to the information age. Computer networks and the internet arose out of the military-academic-industrial complex of the postwar world as a scientific-military communications medium. The military used ARPANET. Scientists, many of whom worked on military projects, used ARPANET and later during the 1980s technological boom—NSFnet. The growing computer network embodied the communications medium of the emerging scientific culture. Only after the Cold War, however, did public commercial control of the internet spawn the information age. For proponents, this represented a vantage point independent of critiques of modernity or postmodernity. For critics, it represented a dangerous ultra-modernity.

In 1984, James Cameron directed the science fiction action thriller *The Terminator*. In the future, Sean Connor leads resistance against an army of machines led by a self-aware computer network called Skynet. The network destroys most of humanity in a nuclear holocaust. The remnants of humanity fight a war against the machines. Arnold Schwarzenegger stars as a cybernetic organism sent back in time to kill Connor's mother before he is born. Connor learns of the plot and sends soldier Kyle Reese back in time to stop the terminator. In a pure example of temporal paradox, Reese impregnates Connor's mother with Connor. He stops the terminator and ensures Connor will be born in the future to fight the machines.[136] Like ARPANET, Skynet was designed as a communications network for the military. *The Terminator* formed a dark critique of the military-industrial complex, computer networks, artificial intelligence, and an information age future in the midst of a technological boom and the proliferation of office networks.

[136] *The Terminator*, directed by James Cameron (Los Angeles: Orion Pictures, 1984).

In 1985 Hawking, who suffered from ALS, was on a trip to the European Organization for Nuclear Research (CERN) in Switzerland. Due to his disease, Hawking caught pneumonia and had to undergo an emergency tracheotomy. From that point forward he essentially became a cybernetic organism—his body moved by an electric wheelchair, his thoughts communicated through a synthesizer connected to a computer. Along quite opposite lines from *The Terminator*, in 1987, *Star Trek: The Next Generation* (STTNG) debuted. Like earlier works of science fiction, STTNG sat side by side in time with more doubtful critiques of science. The show featured the same positivistic future enveloped by a scientific culture as the original. The Enterprise boasts a networked computer system accessible by voice from anywhere on the ship. This computer allows communication with any ship or installation in Starfleet. Every ship in Starfleet acts as a node in a network of advanced starship computers. In a holographic game of cards run by the character Data (an android), Hawking made an appearance on the show as himself with Sir Isaac Newton and Albert Einstein in the episode entitled *Descent*.[137]

In 1988, Sagan wrote the introduction for Hawking's first popular science book—*A Brief History of Time*. Sagan told the story of how, in 1974, he accidentally entered the room where the Royal Society was in the midst of initiating Hawking. He entered while Hawking was signing his name in a book that contained the signature of Isaac Newton. Hawking would become the Lucasian Professor of Mathematics at Cambridge University in 1979, a position that Newton once held. Sagan stated that this is a book about the frontiers of physics but, "This is also a book about God… or perhaps the absence of God."[138]

[137] *Star Trek: The Next Generation*, "Decent," directed by Alexander Singer, aired June 21, 1993 (Hollywood: Paramount, 1993).
[138] Stephen Hawking, *A Brief History of Time* (New York: Bantam, 1988), x.

A Brief History of Time was essentially a short history of science that began with Aristotle, discussed Ptolemy and Galileo, and made its way to Edwin Hubble's discovery of galaxies (1924) and the expansion of the universe in 1929. The discovery of the expansion of the universe meant that the universe was no longer thought of as static and unchanging. This brought about ideas of the universe's potential beginning or end, and whether it is bounded or unbounded. Hawking explained principles of relativity and quantum mechanics. He also explained elementary particles, the forces of nature, and their historical origins. Aristotle believed that earth, wind, fire, and water could be divided forever while Democritus believed that individual atoms existed. "For centuries the argument continued without any real evidence on either side, but in 1803 the British chemist and physicist, John Dalton, pointed out the fact that chemical compounds always combined in certain proportions could be explained by the grouping together of atoms to form units called molecules."[139]

With a history of science in place, Hawking proceeded to the heart of the book that described black holes and the big bang. Black holes are a point in space that contain so much matter condensed into one place that space-time warps drastically around it and the laws of physics seem to break down. Stars that collapse in on themselves can become black holes. The big bang is an event that occurred 14 billion years ago and initiated the universe. It began as a point in space. A unified theory of relativity and quantum mechanics would explain the apparent breakdown of the laws of physics in a black hole. Work on black holes, the big bang, and a unified theory would not be possible without the collaborative work of many scientists over the centuries. Hawking's book illustrated this fact in the manner that it explained the work of Aristotle, Ptolemy, Copernicus, Galileo, Newton, Kant, Maxwell, Einstein, Heisenberg, Hubble,

[139] Ibid., 63.

and others before possibly delving into subjects such as black holes or the big bang. All of their contributions have been integral. He pushed this worldview of the progress of science—a tenant of scientism—throughout his popular works.

Hawking responded to his own work on black holes and the big bang to make suggestions about the existence of God. The God question pertains to the implications of a universe that is expanding and had a beginning (big bang). Hawking questioned where God (any monotheistic God) fit into the equation. Did he create the universe at the moment of the big bang, or did he create the universe as it is and then create only the appearance of the big bang?[140] Hawking pointed to the majority of the Greek philosophers who "did not like the idea of a creation because it smacked too much of divine intervention."[141] They thought the world was eternal. Hawking insinuated that there is no God by saying if a universe with no boundaries or singularities exists that is completely described by a unified theory, that "that has profound implications for the role of God as Creator."[142] Hawking stopped short of negating God, however, and instead concluded that a unified theory "would be the ultimate triumph of human reason—for then we would know the mind of God."[143]

The author also commented upon the place of philosophy in the present time. Philosophers "have not been able to keep up with the advance of scientific theories." He pointed out that Wittgenstein—whom he considered to be the greatest philosopher of the twentieth century—said that only language remained to be studied by philosophy. "What a comedown from the great tradition of philosophy from Aristotle to Kant!"[144] Hawking exclaimed. This

[140] Ibid., 9.
[141] Ibid., 7.
[142] Ibid., 174.
[143] Ibid., 175.
[144] Ibid., 174-175.

sentiment foreshadowed Hawking's later statements concerning the obsolescence of philosophy in the face of science.

In the introduction to *A Brief History of Time*, Hawking linked principles of natural selection to intelligence and scientific discovery. He said that advances in science have been both advantageous and detrimental to the survival of the species. Where intelligence is concerned, "some individuals are better able to draw the right conclusions about the world around them and to act accordingly." And, "their pattern of behavior and thought will come to dominate." It is certain that "in the past that what we call intelligence and scientific discovery has conveyed a survival advantage." In the present, this might not hold true: "our scientific discoveries may well destroy us all."[145] Hawking did not explicitly state it in this passage, but it seems almost certain in light of what he said in other places that he spoke of nuclear war and global warming.

In 1988, Hawking, Sagan, and science fiction writer Clarke appeared on a talk show entitled *God, the Universe and Everything Else* with host Magnus Magnusson to celebrate Hawking's book. Sagan attended on a television screen over one of Clarke's "artificial satellites." During the show, Sagan claimed that more scientists would make the world a better place, advocated joint Soviet-American space exploration, and said there was no evidence for a God in the religious sense—there are only the laws of the universe. Clarke framed his opinion through a quote—"Politics and religion are obsolete. The time has come for science and spirituality." Science is a self-correcting subject, unlike politics, said Clarke. Hawking stated that the laws of science might have held at the beginning of time. God would have had no freedom and the universe would have begun according to the laws of science alone. The three

[145] Ibid., 12.

also discussed extraterrestrial life. Hawking was pessimistic about human contact with aliens, suggesting they would be hostile. Sagan and Clarke were more optimistic. Sagan said we had no choice but to contact them in a friendly manner because we had already announced ourselves through radio broadcasts. Clarke asserted that any hostile species would self-destruct, perhaps as humans were in danger of doing.[146] The talk show session presented a united front against religion and a faith in science's ability to answer questions about God, the universe, and everything else—scientism.

Post-Cold War Exchange

This section argues that creationists and theologians acted as an opposing force to scientism by criticizing the assertions of Hawking's 1988 popular science book *A Brief History of Time*. It shows how Hawking retaliated in a 1993 popular science book that defends his position of scientism. It also shows how Hawking simultaneously warned of dangerous products of science such as global warming and nuclear weapons.

In 1988, NASA announced that strong evidence existed for anthropogenic global warming. This event marked the moment when the global warming debate transferred from predominantly the discussion of scientists to more public discourse. Since the early 1970s, NASA had taken advantage of ARPANET to run climate simulations.[147] The advent of the commercial internet catalyzed the climate debate and one of the internet's greatest proponents—Senator Gore—would become one of climate change's most outspoken activists.

[146] *God, the Universe and Everything Else*, directed by Hector Stewart (Birmingham: Central Independent Television, 1988).
[147] Abbate, *Inventing…*, 98.

In 1990, President George H.W. Bush committed American troops to the Persian Gulf after the Iraqi invasion of Kuwait. American technological prowess of the 1980s technological boom thoroughly routed the forces of dictator Saddam Hussein. In 1992, the Soviet Union definitively ended and the military-academic-industrial complex computer network opened to the public. Hawking used the moment to defend himself against critics and to deliver his arguments—to claim that God, religion, and philosophy are obsolete, to reiterate NASA's warning concerning global warming, and to reinforce that nuclear weapons still posed a threat in the post-Cold War world.

In the book *Black Holes and Baby Universes* (1993) Hawking again discussed God and responded to critics of *A Brief History of Time*. After the release of the 1988 book, philosophers and theologians attacked Hawking for suggesting that the universe needs no creator. For instance, a 1990 article in the *British Journal for the Philosophy of Science* argued that Hawking made no valid argument against the existence of God. The author stated, "…it seems to me that far from banishing God from reality, Hawking invites us to make Him [God] the basis of reality." Furthermore, the author claimed that Hawking relied upon a "defunct positivistic theory."[148] Hawking also had to contend with creationists like Hugh Ross who have criticized Hawking multiple times since the release of the book. In a 1989 article entitled "Quantum Mechanics, a Modern Goliath" posted on the website *Reasons to Believe* (reasons.org), Ross argued that Hawking's discussion of imaginary time actually means that God does exist—he exists in imaginary time because God "transcends 'real time.'"[149] Hawking's 1988 book coincided with Jerry Falwell's Christian Right movement The Moral Majority.

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[148] William Lane Craig, "What Place then for a Creator?: Hawking on God and Creation," *The British Journal for the Philosophy of Science* 41 (1990),473-491.

[149] Hugh Ross, "Quantum Mechanics, a Modern Goliath," *reasons.org*, accessed June 20, 2014, http://www.reasons.org/articles/quantum-mechanics-a-modern-goliath.

Hawking fired back by reiterating his arguments in the 1993 book: if the no-boundary proposal (theory that the universe is bounded) holds true, the position of God in the affairs of the universe is up in the air. The no-boundary proposal implies that the universe eternally had the same laws, and there would have existed no moment in which God could have initiated the laws. God could have chosen the specific laws, however, but there may not have been much of a choice since only a few laws could bring us to our current state.[150]

According to Hawking, science had been such a successful enterprise that it had made theology and philosophy obsolete. In an essay entitled *My Position*, Hawking dismissed haughty academics and false intellectuals who had labelled him with –ists and –isms. He had been "called a nominalist, an instrumentalist, a positivist, a realist and several other ists."[151] Their strategy utilized "refutation by denigration." Hawking's position delivered several scathing statements:

> There is a subspecies called philosophers of science who ought to be better equipped. But many of them are failed physicists who found it too hard to invent new theories and so took to writing about the philosophy of physics instead.[152]

Hawking said that many philosophers did not even understand modern science and therefore were not informed enough to make philosophical assessments concerning science. Furthermore, "The people who actually make the advances in theoretical physics don't think in the categories that the philosophers and historians of science subsequently invent for them."[153] Essentially, Hawking said that philosophy should be left to the scientists who make groundbreaking discoveries. Some of their philosophies can be found in their popular science

[150] Stephen Hawking, *Black Holes and Baby Universes* (New York: Bantam, 1993), 98.
[151] Ibid., 42.
[152] Ibid., 41-42.
[153] Ibid., 42.

works where they advocate scientism. Historically, it makes perfect sense because science grew out of philosophy. Before the nineteenth century, all who engaged in the most advanced science of the day were deemed natural philosophers. As natural philosophy advanced, the delineations of modern disciplines such as physics, chemistry, and biology arose. Philosophy sought the truth and science became the best method for finding the truth. For Hawking, the scientists are the philosophers and science remains as the only viable manner of finding truth. This is scientism.

Hawking also said in *Black Holes and Baby Universes* that nuclear weapons are the most urgent science related issue facing the people of the world. "The relaxation of east-west tensions brought about by the ending of the cold war has meant that the fear of nuclear war has receded from public consciousness. But the danger is still there as long as there are enough weapons to kill the entire population of the world many times over."[154] The weapons are still aimed at all of the major cities in the Northern Hemisphere. Computer or human error could result in a global nuclear war. The acquisition of nuclear weapons by minor powers poses a threat as well. A war between minor powers could draw the full brunt of the major powers' arsenals into the fray.[155]

Hawking thought it imperative that "the public realize the danger and put pressure on all governments to agree to large arms cuts." He joked that the reason intelligent life from other worlds has not contacted us is because species at our level of development usually destroy themselves. He pointed to global warming and food supply issues as other major global conundrums, but asserted that "a nuclear war could mean the end of all human life on earth within days."[156]

[154] Ibid., 30.
[155] Ibid.
[156] Ibid., 30-31.

Aggression gave cavemen an awesome ability to fight and survive in a wild primordial earth. "The tremendous increase in our powers of destruction brought about by modern science and technology, however, has made aggression a very dangerous quality, one that threatens the survival of the whole human race."[157] Hawking pleaded with the reader, unless we use our intelligence to outwit our aggression, "the entire human race will be wiped out by a calamity such as nuclear war." Like Sagan, Hawking wanted to go to the stars, but less for exploration and more because the colonization of other worlds would decrease the chance of human extinction in the event of a nuclear war.[158] If humans do kill themselves, they will be but another victim of natural selection. "Maybe some other race of intelligent beings elsewhere in the galaxy will achieve a better balance between responsibility and aggression."[159]

Hawking spoke of the Oracle at Delphi and the strategy of making predictions that go both ways within a passage concerning chaos and the future entitled *The Future of the Universe*. The story goes that before the first Persian invasion of Greece, the oracle predicted Sparta's destruction or the death of the king. King Leonidas died in the pass at Thermopylae defending Greece. Sparta survived. Hawking brought forth the story of the Lydian king Croesus just as Sagan did.[160] In doing so, Hawking attempted to bring forth the chaos and unpredictability inherent in making predictions about small systems—systems like Earth with beings as chaotic as apes. Hawking admitted that he was "in the well-established tradition of oracles and prophets of hedging my bets by predicting both ways."[161] Again, a scientist compared himself to an oracle. This is not an odd comparison for adherents to scientism. In this instance, Hawking

[157] Ibid., 136-137.
[158] Ibid., 137.
[159] Ibid., 138.
[160] Ibid., 142.
[161] Ibid., 155.

spoke of the expansion or contraction of the universe, but the idea alludes to his predictions regarding the destruction or survival of the human race. Will humans destroy themselves or go to the stars or end up like the dinosaurs?

It was thought that the age of the reptiles came to an end some 65 million years ago in a nuclear winter of a different sort—the cataclysmic impact of a massive rock from space that spewed dust and debris into the atmosphere and caused a Cretaceous cold and dark. It turns out that ape mammals possess enough cold-bloodedness tucked behind the greater portion of their brains to induce a winter of their own. "The human race does not have a very good record of intelligent behavior."[162] Although the greatest genius of the twentieth century, Albert Einstein, pointed out to President Roosevelt that recent research "would also lead to the construction of bombs," Hawking noted: "Einstein himself took no part in the Manhattan Project and was horrified by the dropping of the bomb."[163] Great thinkers think alike—strong proponents of the enterprise of science, nuclear war horrified both Hawking and Einstein.

Synthetic History of Science

This section argues that Hawking used popular science works to build a linear, progressive history of science—a tenant of Hawking's scientism. It also further underlines the dangers of the post-Cold War information age world. Hawking took advantage of the situation to push a scientific space-based culture by insisting that humans colonize space to survive.

During the mid-1990s, many web based companies arose out of the commercialization of the internet. Their stock values quickly rose in what came to be known as the dotcom bubble. This bubble burst between 1999 and 2001 and many companies went under, although companies

[162] Stephen Hawking, *The Universe in a Nutshell* (New York: Bantam, 2001), 87.
[163] Ibid., 13.

like amazon.com retained lasting success. In the midst of the bubble—1998—President Bill Clinton committed United States military support to the North Atlantic Treaty Organization (NATO) strike against federal Yugoslavian forces committing war crimes in the province of Kosovo. NATO forces overwhelmed opposition with airstrikes. Soon after President George W. Bush was elected in controversial 2000 elections, he refused to sign the Kyoto Treaty that limits greenhouse emissions. On September 11, 2001 (9/11), terrorists used box cutters to highjack airliners and fly them into the World Trade Center in New York and the Pentagon in Washington. Religious fanatics using archaic weapons struck at the heart of a scientific goliath and the internet exploded with a patriotic outcry of American support for the victims of the terrorist attack.

Weeks after the 9/11 terror attacks, Congress and the Bush administration passed the Patriot Act. According to the American Civil Liberties Union (ACLU) the Bush administration pushed the legislation through by threatening that congressmen who did not vote for the bill would be blamed for future attacks. Furthermore, the ACLU claimed that portions of the Patriot Act are unconstitutional. Specifically, the Patriot Act violates rights to lawful search and seizure guaranteed by the Fourth Amendment. Indirectly, the Act violates citizens' First Amendment rights by allowing unlawful searches based on the books they read or the websites they visit. The Act allows law enforcement, such as the FBI, to spy on citizens' internet usage, or to force internet service providers to hand over records of clients. The Patriot Act became a manner in which corrupt United States governments could use the internet against its own citizens by violating their constitutional rights.[164]

[164] ACLU, "Surveillance Under the USA PATRIOT Act," *ACLU*, December 10, 2010.

In the brave new information age of the internet, terror networks, and global warming, Hawking built up a linear history of science. He published *On the Shoulders of Giants* in 2002. This triumphant vision of the history of science—a history that according to Hawking makes religion obsolete—came amidst the neo-conservative and Christian Right momentum of the Bush administration. The goal of the book is to trace the human picture of the cosmos from Copernicus to Einstein. It contains their works along with a brief biography and commentary.[165] "If I have seen farther, it is by standing on the shoulders of giants." In the introduction, Hawking stated that this quote by Newton "is an apt comment on how science, and indeed the whole of civilization, is a series of incremental advances, each building on what went before." He said that "This is the theme of this fascinating volume…."[166]

The connection between Nicolas Copernicus, Galileo Galilei, Johannes Kepler, Isaac Newton, and Albert Einstein is no secret, but it is telling that Hawking chose to string them together in a book that builds the modern image of the cosmos. Copernicus heretically published *On the Revolutions of Heavenly Spheres* from his deathbed in 1543. The work describes the heliocentric model, which broke church adherence to the geocentric Aristotelian and Ptolemaic models (the church favored an Earth-centered cosmos where man was central). Galileo and Kepler picked up the scent. Galileo wrote *Dialogue Concerning the Two Chief World Systems* (1632), advocating the Copernican model. Kepler worked out the mathematics of elliptical orbits in the heliocentric model in *Astronomia Nova* (1609) and *Harmonies of the World* (1619). Newton caught wind of Copernicus, Galileo, and Kepler and published the *Principia* (1687) which debuted the inverse-square law of gravity. Newton's classical physics dominated

[165] Stephen Hawking, *On the Shoulders of Giants* (London: Running Press, 2002), ix.
[166] Ibid.

scientific ideas until Einstein shattered them with the theory of a relativistic universe in the early twentieth century.

Basically, Hawking reiterated this story along with selections from the thinkers' works. The reiteration is not without purpose, however. Hawking selected the minimal key five physicists and astronomers who built the modern edifice of human understanding of the cosmos. Five is concise, easy to follow, and the connection between the five is extremely apparent. In fact, Hawking's thread argued that these are the five men that built modern science and they are intimately intertwined. Hawking compiled the work of these thinkers into a volume that pushed his brand of scientism and his version of the history of science.

In 2003, in the wake of the 9/11 terror attacks, the Bush administration convinced Congress to conduct a war in Iraq to topple the regime of Saddam Hussein. The administration claimed that Iraq possessed weapons of mass destruction. The technological prowess of coalition forces, made predominately of American and British troops, easily defeated the Iraqi military. Coalition forces found no weapons of mass destruction in Iraq, however. After the war, American and British companies acquired various contracts in the country. The war could have been conducted for oil.[167]

In 2006, Vice President Al Gore narrated the documentary entitled *An Inconvenient Truth*. Gore claimed that the most vulnerable part of the earth's ecological system is the atmosphere. He stated, "My friend the late Carl Sagan used to say—if you had a big globe with a coat of varnish on it, the thickness of that varnish relative to that globe, is pretty much the same as the thickness of the earth's atmosphere compared to the earth itself. And it's thin enough that we're capable of changing its composition." The documentary made a compelling case for

[167] Antonia Juhasz, "Why the War in Iraq was Fought for Big Oil," *CNN*, April 15, 2013.

anthropogenic global warming, showed Sagan's influence on politicians, and reinforced the claim of scientists that climate change is indeed manmade.[168]

The same year, Hawking attended a news conference in Hong Kong where he reiterated his position concerning space exploration as a means of human survival: "It is important for the human race to spread out into space for the survival of the species." He continued, "Life on Earth is at the ever-increasing risk of being wiped out by a disaster, such as sudden global warming, nuclear war, a genetically engineered virus or other dangers we have not yet thought of." Hawking also stated that in the following decades, humans could have a permanent base on the moon and a colony on Mars. He speculated that if humans could avoid killing themselves in the next 100 years, they should have permanent space settlements that could survive without help from Earth.[169]

Shortly after, Hawking attended a conference on string theory in Beijing. During the conference he gave a speech in front of 500 people that warned of global warming. Hawking stated that he was "very worried about global warming," and that "Earth might end up like Venus, at 250 degrees centigrade and raining sulfuric acid." The Associated Press article reporting on the conference and the speech claimed that Hawking's comments were pointed at China, the world's second largest contributor to greenhouse gases following the United States. It also stated that if global warming is not averted, experts agree that glaciers could melt, cities would be in danger, and other environmental disasters imminent.[170] His warnings are an example of a scientist taking responsibility for the products of science.

[168] *An Inconvenient Truth*, directed by Davis Guggenheim (Los Angeles: Paramount, 2006).
[169] Sylvia Hui, "Hawking says humans must go into space to survive," *The Associated Press*, June 13, 2006.
[170]Alexa Olesen, "Stephen Hawking warns about warming," *The Associated Press*, June 22, 2006.

In 2007, Hawking spoke at a conference in London where the Royal Society decided to move the Doomsday Clock five minutes forward because of increased dangers throughout the world. Scientists created the clock in 1947 after the detonation of nuclear weapons during WWII to illustrate the risk of nuclear war. At the conference, Hawking stated, "As we stand at the brink of a second nuclear age and a period of unprecedented climate change, scientists have a special responsibility, once again, to inform the public and to advise leaders about the perils that humanity faces." And, "As scientists, we understand the dangers of nuclear weapons and their devastating effects, and we are learning how human activities and technologies are affecting climate systems in ways that may forever change life on Earth." He gave a stern warning and said there would be great perils if people "do not take action now to render nuclear weapons obsolete and to prevent further climate change."[171] Hawking's comments at the Royal Society reinforce his warnings concerning both global warming and nuclear war in the post-Cold War world.

In the book *God Created the Integers* (2007), Hawking traced the mathematical advancements that changed history. The book contains a collection of mathematical selections from Euclid to Alan Turing in an attempt to track the evolution "in mathematical thinking from its beginnings to today."[172] Hawking provided a brief biography and summation of the importance of each mathematician's work. The title is a quote from mathematician Leopold Kronecker. Hawking mostly likely used it ironically (to mock God) and to increase sales because the book has nothing to do with God.

[171] Steve Connor, "Hawking warns: We must recognize the catastrophic dangers of climate change," *The Independent*, January 18, 2007.
[172] Stephen Hawking, *God Created the Integers* (London: Running Press, 2007), xiv.

In the introduction, Hawking underlined the manner in which mathematical and scientific knowledge builds upon itself: "Isaac Newton never could have formulated his laws without the analytic geometry of René Descartes…." And, "It is hard to imagine the development of either electrodynamics or quantum theory without the methods of Jean Baptiste Joseph Fourier or the work on calculus and the theory of complex functions pioneered by Carl Friedrich Gauss and Augustin-Louis Cauchy…."[173] Hawking credited Euclid with articulating the ancient Greek understanding of geometry within his *Elements* (c.300 BC), and he gave credit to Diophantus, the Greek Alexandrian, for developing symbolism in Algebra. "Over a millennium later, Frenchman René Descartes united the two fields: geometry and algebra, with his creation of analytic geometry."[174]

Euclid was a compiler who was familiar with "all of the Greek mathematics that had preceded him."[175] He is the first mathematician featured in the study, but Hawking brought Pythagoras to the fore as Euclid's predecessor. The Pythagoreans sought to describe all of the cosmos in terms of numbers and scale. They stumbled upon the square root of 2 and irrationality soon impeded their efforts as it became apparent that certain values could not be expressed in terms of whole numbers. "They turned to geometry," which manifested itself most prominently in Euclid's work.[176] Like later modern scientists and mathematicians, Euclid utilized the work of his predecessors.

Next is Archimedes, a Greek Syracusan best known for the invention of the Archimedes screw and the formula for finding the area of a circle. A Roman soldier supposedly killed him

[173] Ibid., xiii.
[174] Ibid., xiv-xv.
[175] Ibid., 1.
[176] Ibid., 2-3.

during the Second Punic War in 212 BC.[177] Hawking discussed Diophantus as the last mathematician from antiquity. Historians believe that Diophantus died around 284 AD. The next mathematician in the book lived over one thousand years later in France. The natural philosophy curriculum of René Descartes "included the study of Euclid, Archimedes, and Diophantus as well as contemporary mathematics."[178] Descartes learned from the Greek's crisis with the irrational and rejected their geometrical limitations. Instead of a cube being realized as a literal cube (the manner of the ancient Greeks), Descartes shows in his *Geometry* that a cube could be described as a series of proportions. The cube of a quantity *x* is designated as *x*^3.[179] *God Created the Integers* is relevant to scientism because it presents a history of mathematics—a facet of science—in a progressive, linear manner.

In 2007, Hawking wrote the introduction to physicist Lawrence Krauss's book *The Physics of Star Trek.* He discussed his meeting with Data, Newton, and Einstein on the Enterprise. The professor said, "Science fiction like Star Trek is not only good fun but it also serves a serious purpose, that of expanding the human imagination." Hawking also used the space to reiterate the connection between science fiction and science fact—that science fiction influences science, and that science influences science fiction. Hawking concluded by further encouraging space exploration: "To confine our attention to terrestrial matters would be to limit the human spirit."[180] Krauss's book explored different technology found throughout the *Star Trek* universe and its potential creation and application in the real world. It tied together *Star Trek*, science fiction, positivity, and a faith in science, and included the words of two adherents to scientism—Hawking and Krauss.

[177] Ibid., 119.
[178] Ibid., 286.
[179] Ibid., 289-90.
[180] Lawrence Krauss, *The Physics of Star Trek* (New York: Basic Books, 2007), xi-xiii.

In 2008, Hawking gave a speech in Washington, D.C. to commemorate the fiftieth anniversary of NASA. The speech called for colonies on the moon and Mars and a tenfold increase in NASA funding. Hawking invoked Kennedy's dream: "A goal of a base on the Moon by 2020 and of a manned landing on Mars by 2025 would reignite the space programme and give it a sense of purpose in the same way that President Kennedy's Moon target did in the 1960s." The professor also repeated his plea for space exploration as a means of human survival: "If the human race is to continue for another million years, we will have to boldly go where no one has gone before." Hawking insisted that mankind had the resources to fight global climate change on Earth while simultaneously exploring the stars and that humans should seek to colonize Earthlike planets in other star systems. "…we should make interstellar travel a long-term aim." He spoke of SETI (Search for Extraterrestrial Intelligence) and speculated on intelligent life in the universe. One conclusion was that intelligent life tends to destroy itself quickly. As for intelligence in our own solar system, Hawking concluded that "Some would say it has yet to occur on Earth."[181]

In a 2009 ceremony celebrating "extraordinary agents of change," President Barrack Obama awarded Hawking the Presidential Medal of Freedom—the highest civilian honor in the United States. The President's words that day spoke much of the dichotomy between the positive and the doubtful:

> In a moment when cynicism and doubt too often prevail, when our obligations to each other are too often forgotten and when the road ahead can seem too long or hard to tread, these extraordinary men and women, these agents of change remind us that excellence is not beyond our abilities, that hope lies around the corner and that justice can still be won in the forgotten corners of the world. They remind us that we each have it within our powers to fulfil dreams, to advance the dreams of others and remake the world for our children.

[181] David Shiga, "Stephen Hawking calls for Moon and Mars colonies," *New Scientist*, April 21, 2008.

Of Hawking, Obama said, "From his wheelchair, he has led us on a journey to the farthest and strangest reaches of the cosmos. In so doing, he has stirred our imagination and showed us the power of the human spirit."[182] The President of the United States awarded Hawking—an atheist fully committed to the pursuit of science—the highest honor in the land. The award was not given for doubt, or resignation, but for hope and optimism in a future that could still be *won*.

During a 2010 interview, Hawking again reiterated concerns of nuclear war, resource depletion, overpopulation, and the need for human space colonization. Hawking stated that the human race was in danger and that, "There have been a number of times in the past when its survival has been a question of touch and go. The Cuban missile crisis in 1963 was one of these. The frequency of such occasions is likely to increase in the future." He said avoiding such disasters would prove difficult and the only viable option was for humans to move into space. "Our only chance of long-term survival is not to remain inward looking on planet Earth but to spread out into space." Despite the dark prospects, Hawking remained optimistic: "If we can avoid disaster for the next two centuries, our species should be safe, as we spread into space." The physicist warned, however, that contrary to Sagan's optimism surrounding contact with intelligent extraterrestrial species, that they might be hostile and unfriendly.[183]

Philosophy is Dead

This section shows how Hawking claimed that philosophy and religion were dead, and that only science remained to answer questions about humanity and the universe—scientism.

[182] Andy Bloxham, "Stephen Hawking Awarded Presidential Medal of Freedom by Barrack Obama," *The Telegraph*, August 12, 2009.
[183] Richard Alleyne, "Stephen Hawking: mankind must move to outer space within a century," *The Telegraph*, August 9, 2010.

Hawking again responded to critics and philosophers in his book *The Grand Design* (2010). Unlike *A Brief History of Time* that focused mainly on black holes and only made arguments against God on the periphery, *The Grand Design* unequivocally claimed that the historical progress of science had triumphed over religion and philosophy and that God does not exist. Shortly after the release of the book, Hawking attended a meeting which particularly illustrated the argument of the book—that the history of science destroyed religion, philosophy, and God.

In a speech at the 2011 Google Zeitgeist meeting concerning publication of *The Grand Design*, Hawking stated again that "philosophy is dead" and that "philosophers have not kept up with modern developments in science." He also made further commentary about the existence of God. Like Sagan, he demonized religion as something dark and science as something luminous that has replaced it: "Regularities in the motion of astronomical bodies… suggested that they were governed by fixed laws rather than be subject to the arbitrary whims and caprices of gods and demons." Hawking posited that early human civilizations could not easily discern laws or patterns in nature. Gradually, however, humans discerned patterns and developed the idea of scientific determinism.[184] What Hawking meant was that humans in the past saw phenomenon in nature and attributed them to Gods. Once humans developed science, they attributed the same phenomenon to naturally occurring patterns (i.e., the predictability of storms due to weather patterns, volcanos due to seismic activity).

The Grand Design (2010) opened with the same claim that, "…philosophy is dead…. Scientists have become the bearers of the torch of discovery in our quest for knowledge."[185] Like Sagan, Hawking credited the ancient Ionians for beginning science.[186] He stated that, "In

[184] Stephen Hawking, "Speech at Google Zeitgeist," YouTube, accessed July 28, 2014, http://www.youtube.com/watch?v=r4TO1iLZmcw.
[185] Stephen Hawking and Leonard Mlodinow, *The Grand Design* (New York: Bantam Books, 2012), 1.
[186] Ibid., 17.

the history of science we have discovered a sequence of better and better theories or models, from Plato to the classical theory of Newton to modern quantum theories."[187] Again, Hawking proposed a progressive history of science. The book, coauthored by physicist Leonard Mlodinow, explained the concept of model-dependent realism. It revolves around the idea that human beings understand the world by making a model of what is brought to them by their senses.[188] Scientific theories are models that attempt to describe facets of reality. For instance, it is possible to have two ideas of how atoms exist in reality. One model may assume that they are single points in space while another model describes them as having moving parts with a nucleus and electrons.

Model-dependent realism has a strong correlation with the scientific thema of Gerald Holton. Every model in model-dependent realism bases itself upon an underlying thema which remains largely unchanged. The thema of atomism represents the perfect example of how a model concerning a specific thema has changed over time. In the fifth century BC, the ancient Greek Democritus conceived the notion of an atom—an indivisible, elemental particle. To the Greeks, an atom might have been an elemental piece of earth, wind, fire, or water. To the Englishman John Dalton at the turn of the nineteenth century, an atom was an indivisible piece of one of many elements, such as copper or gold. At the turn of the twentieth century, the model of the atom remained an indivisible portion of one element, but it had acquired a nucleus with electrons swirling about it. Shortly afterwards, when physicists realized that pieces that small do not act according to laws of classical physics, they adopted the quantum mechanical model of the atom. The word atom becomes a misnomer here because the thema of atomism extends now to

[187] Ibid., 7.
[188] Ibid.

the indivisible quarks and electrons (we retain the word atom, however, because it is fully integrated into colloquial usage).

Hawking insisted that science is a progression in which better and better models have been adopted over time. "Philosophers from Plato onward have argued over the years about the nature of reality."[189] And what they have come up with are different models to describe the same underlying thema.

Model-dependent realism is important to Hawking's scientism because it describes how science has functioned throughout history. It implies that science is a progressive, self-correcting enterprise—something that religion can never be. It is dangerous to critics in the same manner that most positivistic thinking is dangerous. For instance, an NPR article entitled "A Little Philosophy is a Dangerous Thing" asserted that Hawking and coauthor Mlodinow were positivists. It also stated, "Model-dependent realism is not an up-to-date physics solution to a problem once relegated to philosophy; it's a rehash of philosophical ideas whose real interest seems to elude the authors."[190] The article was partially correct—in large part model-dependent realism is a rehash of Holton's concept of thema. It did not do well to undermine model-dependent realism or explain the "real interests" behind the philosophical ideas, however (the author might mean positivism's encroachment on the social realm, a place where the validity of empirical investigation has been questioned). This is exactly what Hawking meant by refutation by denigration. Critics denigrate him, but explain nothing away. The author of the article may have intended to show that "a little bit of philosophy" threatened Hawking and therefore he

[189] Ibid., 43.
[190] Alva Noe, "A Little Philosophy is a Dangerous Thing," *NPR*, February 4, 2011, accessed July 19, 2014, http://www.npr.org/blogs/13.7/2011/02/04/133363055/a-little-philosophy-is-a-dangerous-thing.

denounced it, but more clearly it illustrated how model-dependent realism is a dangerous idea to its critics.

Also similar to Sagan are Hawking's views concerning God and religion. Like Sagan's discussion of humans attributing supernatural powers to the sky and creating oppressive, malevolent gods, Hawking stated that "Ignorance of nature's ways led people in ancient times to invent gods to lord it over every aspect of human life."[191] Only the Greek miracle saved them from the dark and "was an endeavor marked by a strong interest in uncovering fundamental laws to explain natural phenomena, a tremendous milestone in the history of human ideas."[192]

Hawking claimed that Christianity impeded Greek science. "The Greeks' Christian successors rejected the idea that the universe is governed by indifferent natural law."[193] Thinkers of the middle ages thought it far more useful to study God than natural phenomena. Hawking pointed to Bishop Tempier of Paris who in 1277, upon the orders of Pope John XXI, published a list of 219 condemnable heresies, one of which "was the idea that nature follows laws, because this conflicts with God's omnipotence."[194] Hawking seems to have a deep disdain for anything characteristically medieval and anti-science. He wrote jubilantly, "Interestingly, Pope John was killed by the effects of gravity a few months later when the roof of his palace fell in on him."[195]

Hawking advocated scientific law to explain all phenomena. Laws exist because they give the world order. The idea of natural law began in antiquity and proliferated through the minds of thinkers through the ages: "Both Plato and Aristotle believed, like Descartes and later Einstein, that the principles of nature exist out of 'necessity,' that is, because they are the only

[191] Hawking, *The Grand Design*, 17.
[192] Ibid., 18.
[193] Ibid., 24.
[194] Ibid., 24-25.
[195] Ibid., 25.

rules that make logical sense."[196] Hawking said that many people believe that a God created the universe, but that that belief only raises the question of who created God. He rejected the first-cause God hypothesis and stated that "…it is possible to answer these questions purely within the realm of science, and without invoking any divine beings."[197] This strict adherence to science's power to answer all questions exemplifies scientism.

Hawking turned 70 in 2012. He used the occasion to speak about nuclear Armageddon, global warming, and space colonization in a BBC broadcast celebrating his birthday. The professor spoke of the possibility of human extinction. "It is possible that the human race could become extinct but it is not inevitable. I think it is almost certain that a disaster, such as nuclear war or global warming, will befall the earth within a thousand years." A quote concerning technology underlines Hawking's faith in science as he simultaneously warned of its dangers: "I am optimistic that progress within science and technology will eventually allow humans to spread beyond the solar system and out into the far-reaches of the universe." Like Sagan, Hawking viewed science as progress while at the same time exercising responsibility and warning the public of potential dangers. Hawking echoed his plea for the colonization of space and again warned that contacting extraterrestrial intelligence might pose grave hazards. "If aliens decided to visit us, then the outcome might be similar to when Europeans arrived in the Americas. That did not turn out well for the Native Americans."[198]

In a 2013 email interview with *The Canadian Press*, Hawking claimed that the world was entering an extremely dangerous period of history. He commented again on primitive survival instincts and aggression and how they could be detrimental in an advanced technological

[196] Ibid., 33.
[197] Ibid., 172.
[198] Matthew Holehouse, "Prof Stephen Hawking: man faces nuclear armageddon and must colonize space," *The Telegraph*, January 6, 2012.

civilization. "Our population and our use of the finite resources of planet Earth are growing exponentially, along with our technical ability to change the environment for good or ill. But our genetic code still carries the selfish and aggressive instincts that were of survival advantage in the past. It will be difficult enough to avoid disaster in the next hundred years, let alone the next thousand or million." The professor asserted once more that colonization of space should be humankind's number one mission. Hawking warned of the dangerous products of science (overpopulation, resource depletion), but added commentary about his fondness of the enterprise. "Science is not only a disciple of reason, but, also, one of romance and passion."[199]

The same year, Matt Damon starred as Max in *Elysium*—a movie that presented viewers with a neo-Victorian future earth. In this dystopia, the majority of earth's inhabitants live in filth-ridden overpopulated conditions. The lucky among them have jobs working in highly industrialized factories. The super-rich who own the majority of the means of production on earth live in an orbital space station named after the ancient Greek equivalent of a heaven reserved for those related to the Gods—Elysium. CIA-type government agents work for corporate interests and maintain the balance of power for the ultra-rich on Elysium. The elites also use robotic officers with limited artificial intelligence. After being exposed to lethal doses of radiation during an industrial accident, Max's only hope of survival is the medical equipment on the orbital station. He finds himself in contact with a subculture that attempts to hack the net to send groups of people to the orbital station, and in conflict with the corporate agents.[200] The movie is an important 2013 critique because of the way it projects the concurrent advances in robotics and the overpopulation problem as divisive issues in a future dystopia. This is coupled

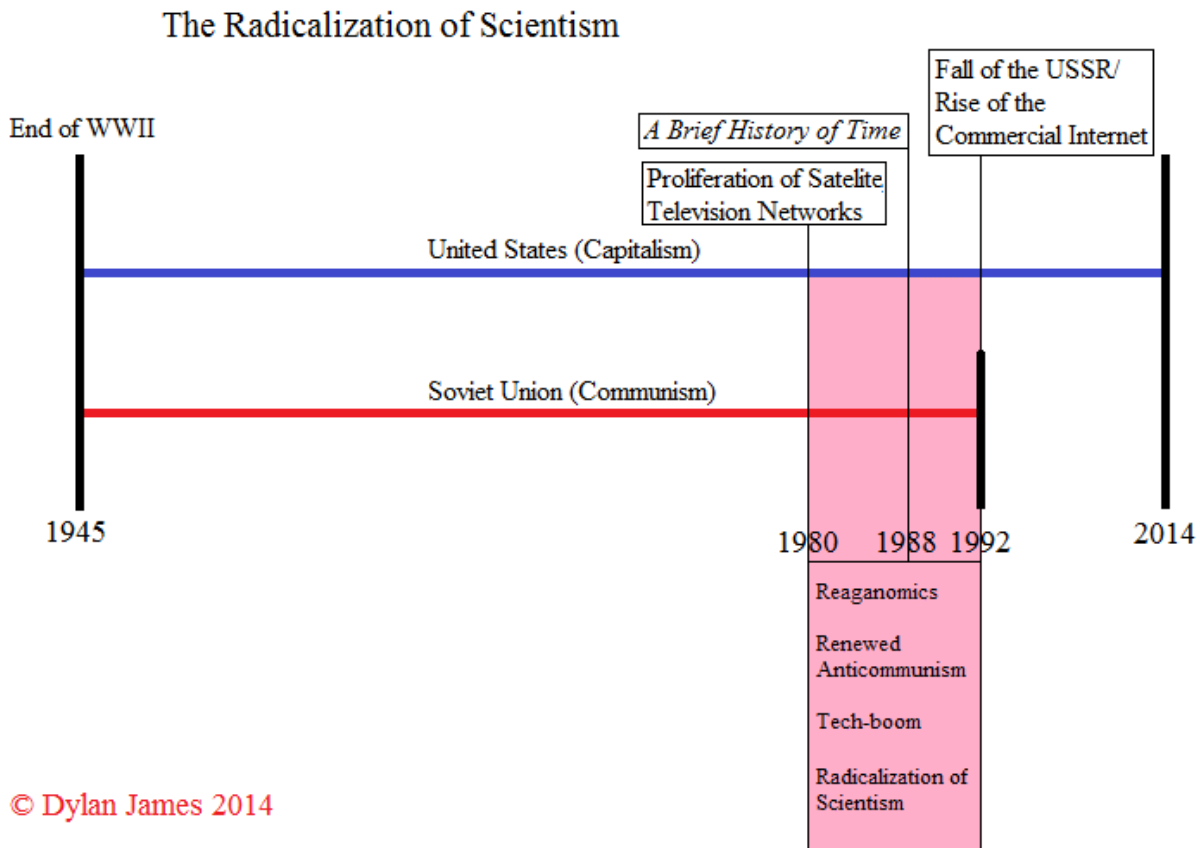
[199] Melissa Breyer, "Stephen Hawking predicts the imminent end of humanity on Earth," *Mother Nature Network*, April 11, 2013, accessed July 19, 2014, http://www.mnn.com/earth-matters/space/stories/stephen-hawking-predicts-the-imminent-end-of-humanity-on-earth.
[200] *Elysium*, directed by Neill Blomkamp (Culver City: TriStar Pictures, 2013).

with the fact that the culture of the ultra-rich is vulnerable to cyber-attack—an emerging early twenty-first century problem. It is relevant to scientism because it portrays one potential negative outcome of a world dominated by science.

Conclusion

Stephen Hawking's career as a public intellectual coincided with the fall of the Soviet Union and the rise of the internet-driven information age. As an individual with ALS, Hawking relied upon technology built into his wheelchair for everyday existence. His scientism bit viperously into all other ways of knowing. Philosophy was dead and historians of science ill-equipped. Throughout his popular works, Hawking built a vision of the progress of science that stemmed from the ancient world that made the existence of God and even philosophy obsolete. In response to critics, Hawking defended his scientism and wrote an entire book that argued that the history of science destroyed the plausibility of God. Similar to Sagan, he communicated his radicalized version of scientism while simultaneously communicating the potential dangers of science. In spite of his condition, and the fact that many dangers remained in the post-Cold War world, Hawking received the Presidential Medal of Freedom from President Obama for being an optimistic scientist who helped expand people's worldview. This optimism sat side by side in time with more doubtful critiques that cast the hypermodernity of the information age in a negative light. Hawking remained hopeful, and insisted that the public understand science so that they could put pressure on world governments to face the problems posed by nuclear weapons, global warming, and overpopulation. He concluded that venturing into space might be the only viable option for human survival in the centuries to come.

Hawking's advocation of scientism, the 1980s technological boom, Reaganomics, renewed anticommunism, the historical breach opened by the fall of the Soviet Union, and the rise of the internet-driven information age marked the radicalization window of scientism in the late twentieth century. By the 1980s, global satellite networks relayed television shows and news from around the world. Industrial capitalism triumphed over communism. Relaxation of east-west tensions allowed for the commercialization of the internet. American free market enterprise had delivered the technological global network that Clarke and other scientists had envisioned. Coupled with reinforced theories on the origin of the universe (big bang), it was the perfect time to denounce God and proclaim the scientific and technological prowess of capitalist human in his place. At this point, science not only directed society in a material manner, but dominated society's more cognitive channels of communication; people's brains merged (literally, their neural pathways adapted to this manner of communication) with the communications channels of the information age. Below is a diagram illustrating the historical moment:


The Radicalization of Scientism
End of WWII
A Brief History of Time
Fall of the USSR/
Rise of the
Commercial Internet
Proliferation of Satelite
Television Networks
United States (Capitalism)
Soviet Union (Communism)
1945
1980
1988
1992
2014
Reaganomics
Renewed
Anticommunism
Tech-boom
Radicalization of
Scientism
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The New Atheism: Disciples of Scientism

Introduction

This chapter argues that New Atheism arose as a broad scientism movement at the turn of the twenty-first century in response to the writings of Sagan, Hawking, and the second string revolution. According to the New Atheists, the New Atheism movement emerged in response to the 9/11 terrorist attacks and the neoconservatives that had aligned themselves with the Christian Right. This is not the whole story, however. A collusion of different forces caused the movement. The New Atheists further radicalized the scientism program of Sagan and Hawking by taking an extreme offensive position against religion and pushing a scientific worldview through popular science works.

The New Atheism is a radical form of atheism that lashes out at world religions and proposes a rational, scientific worldview. It is "New" because the old atheism was passive. New Atheism actively assaults religion in the name of science and reason. Scientists like Michio Kaku, Richard Dawkins, and Brian Greene all discussed the anthropic principle in their books. Dawkins stood at the forefront of the New Atheism movement and presented the anthropic principle in a manner that directly attacked the need for a creator. Kaku and Greene's books were a corollary to the mainstream New Atheism movement and discussed the anthropic principle in a similar fashion. Brandon Carter put forth the anthropic principle in the 1970s, but scientists never took it seriously until advances in physics suggested multiple universes could indeed exist. This occurred in 1995 when physicist Edward Witten proposed that differing versions of string theory were actually one underling theory (M-theory)—the so called second string revolution. Advocates of scientism immediately added the anthropic principle to the arsenal of scientism aimed at reinforcing science's omniscient power and undermining the notion

of God. The anthropic principle allowed an even higher degree of radicalization than Hawking's 1988 questioning of God's existence by adding legitimization to the denouncement of God.

Just like Sagan and Hawking before them, the new atheists pushed a scientific worldview while simultaneously warning of the three most grave threats to humanity—nuclear weapons, global warming, and overpopulation. Science would fix the problems, while at the same time renouncing mythical God and mending the ills of twentieth century hyper-industrialization. Kaku warned of the dangers of global warming and of nuclear weapons in both the context of the Cold War and the post-Cold War world. Greene also warned of the problems posed by climate change. He co-founded the World Science Festival in New York to promote a cultural shift towards science and help educate a potentially scientifically illiterate public. Like Sagan, he held an optimistic view of space exploration.

Greene is a theoretical physicist who works on string theory. He received his PhD from Oxford in 1986 and is as a professor at Columbia University in New York. Kaku is also a theoretical physicist who works on string theory. He is a professor at City College of New York. Dawkins is an outspoken English biologist and atheist who served as Oxford University's Professor for Public Understanding of Science until 2008.

Roots of New Atheism

This section traces the history of atheism, and subsequently New Atheism, and claims that Sagan and Hawking both strongly influenced the movement and took part in it. It claims that the New Atheism movement was the culmination of and continuation of Sagan and Hawking's already extant scientism program. It also introduces groups such as the Christian

Right and the neoconservatives. The section begins with the story of one of the first known atheist-materialists (potential early adherent to scientism), Democritus.

Atheism has roots extending all the way to Democritus in ancient Greece. Democritus lived in the fifth century BC. He deduced from pure thought that the entirety of the cosmos consisted of atoms and the void—a jumble of randomly moving elementary particles in space. Such a formulation caused Democritus to doubt the truth of the pantheon of the ancient Greek gods. Democritus thought that people believed in the gods out of fear of naturally occurring phenomena. They attributed these occurrences to the gods. Democritus believed that rational thought explained nature and that religion was not needed. His beliefs resembled atheism.[201] His beliefs also resembled scientism because he was a materialist and an atheist.

Democritus influenced another ancient Greek, Epicurus, who was born in the fourth century BC and founded the Epicurean school of thought. Epicurus subscribed to atomism and did not believe in an afterlife. After death, he maintained, the atoms dispersed and the body and soul ceased to exist. Epicurus believed in the gods, but thought that they did not intervene in human affairs. Because of this, his views resembled deism—the notion that a god or gods sets the universe in motion, but does not interfere afterward.[202]

Deism is important to the history of atheism, and consequently New Atheism (and scientism), because like the successive diminution of the human place in the cosmos, it represents a step in the successive diminution of God within the human mind. Deism is a step away from theism. Whereas theism posits an all-powerful intervening God or gods capable of

[201] Peter M. Rinaldo, *Atheists, Agnostics, and Deists in America* (Briarcliff Manor, New York: DorPete Press, 2000), 5-6.
[202] Ibid., 7-8.

mischief and miracle, Deism removes God only to the moment of creation. Atheism removes God from the moment of creation, hence removing God altogether.

The thoughts of Democritus and Epicurus influenced the Roman poet Lucretius, who lived in the first century BC. Much of what is known of Epicurus's work comes from the writing of Lucretius. The French philosophers of the eighteenth century learned of Epicurus through his poetry. In his poem, *On the Nature of Things*, Lucretius refutes contemporary Roman religion.[203]

At the end of the fifth century Rome fell and Christianity grew to dominate Europe. Few prominent examples of atheism existed until the sixteenth century. Niccolò Machiavelli was an exception. His book *The Prince* led religious authorities to label him an atheist.[204] As a product of the scientific revolution and the enlightenment, a multitude of deists and atheists appeared. Among them were Thomas Hobbes, David Hume, Voltaire (François-Marie Arouet), Denis Diderot, Thomas Jefferson and the founding fathers of the United States.

The English philosopher Thomas Hobbes, known for his book *Leviathan* (1651) where he advocated the need for a strong central government, was a deist. He did not believe in a personal god. The Vatican prohibited all of his works.[205] The Scottish philosopher David Hume held a deist position bordering upon atheism. In his *Treatise of Human Nature* (1738) he concluded that all human experience comes from impressions (in agreement with John Locke) derived from observation and perception. The Scottish church charged Hume with heresy for arguing against design, but he was acquitted.[206] The French philosopher Voltaire, famous for his book *Candide* (1759) that critiqued every ill of society brought about by religion and state, held a deist position

[203] Ibid., 8-9.
[204] Ibid., 13.
[205] Ibid., 15-16.
[206] Ibid., 18-21.

as well. Voltaire's quote—"If God did not exist, it would be necessary to invent him,"[207] means that if God does not exist in nature, man would invent God to explain nature and to order the affairs of man. It is not an affirmation of God, but a supposition that man created God for his own needs.

Denis Diderot was a Frenchman more radical than Voltaire. He edited the famous *Encylopédie*, a work that appeared over several decades beginning in 1751 that attempted to compile all accessible knowledge. Diderot was an atheist: "I would sacrifice my life, perhaps, if I could annihilate forever the notion of God." He adhered to a scientism characterized by a "grand materialistic world-view," that the senses are the basis of knowledge, and that no final causes exist.[208] In 1784, foreshadowing the French Revolution, Diderot reportedly declared, "Men will never be free until the last king is strangled in the entrails of the last priest."[209]

The European enlightenment spread to Britain's American colonies. Some of the recipients of these ideas became the founding fathers of the new republic of the United States. Among them were James Madison, Benjamin Franklin, Thomas Jefferson, and John Adams. All of these men's deist positions influenced the manner in which they created the secular constitution of the United States. Franklin stated in his autobiography that he became a deist when he was fifteen.[210] During the 1788 Constitutional Convention, Madison—a Virginia representative, pushed through the First Amendment which safeguarded a separation of church and state.[211] In 1797, John Adams signed a treaty with Tripoli to end attacks on American shipping which stated that "the government of the United States is not in any sense founded on

[207] Ibid., 23.
[208] Ibid., 24-25.
[209] Jean-François de La Harpe, *Cours de Littérature Ancienne et Moderne* (Paris : F. Didot Frères, 1840).
[210] Rinaldo, *Atheists…*, 34.
[211] Ibid., 46.

the Christian religion…."[212] The works of the ancients and the French philosophers directly influenced Jefferson's deism. His library included the works of Lucretius, Machiavelli, Hobbes, Hume, Voltaire, and Diderot.[213] In an 1819 letter to a friend, Jefferson confided that he was an Epicurean.[214] Key founding fathers had deist positions—positions considered atheistic by many contemporaries.

In 1837, one of her majesty's ships was returning to port from South America. A British naturalist recounted his experiences decades later:

> When on board H.M.S. Beagle, as naturalist, I was much struck with certain facts in the distribution of the inhabitants of South America, and in the geological relations of the present to the past inhabitants of that continent. These facts seemed to me to throw some light on the origin of species….[215]

Charles Darwin's theory of evolution by natural selection, published in his 1859 book *The Origin of Species*, hammered the nail in the coffin of arguments for intelligent design. Darwin developed the theory while working as a naturalist in South America and the Galapagos Islands. The theory stipulates that the complexity of life on earth arose in a random, non-directed, mechanistic manner that creates the illusion of intelligently designed beings. Alfred Wallace independently discovered evolution by natural selection around the same time as Darwin.

English biologist Thomas Henry Huxley took up Darwin's case and argued it to the public. Popularly known as "Darwin's Bulldog," Huxley began supporting Darwin before the 1859 publication. In 1854, Huxley positively reviewed Darwin's work on barnacle development, casting him as a brilliant naturalist.[216] After the release of *The Origin of Species*, Huxley fended

[212] Ibid., 42-43.
[213] Ibid., 13, 29.
[214] Ibid., 7.
[215] Charles Darwin, *On the Origin of Species* (New York: Bantam, 1999), 3.
[216] Adrian Desmond, *Huxley* (Reading, Massachusetts: Addison-Wesley, 1994), 195.

off religious criticism. He needed a manner in which he could defend science and placate the religious sectors of society without offending them. For this, he formulated the term 'agnostic.' Agnosticism did not oppose Christianity. It was not anti-theist (atheist). The sciences "are neither Christian, nor Unchristian, but are Extra-christian," declared Huxley.[217] Huxley's formulation of agnosticism added an important dimension to religious dissent. For Huxley, it was a political parlance. For later adherents to the term, it was a way to be antireligious, or to claim a position of ignorance concerning God's existence, without rejecting God.

The theory of evolution by natural selection made it easier to reject God and the first cause hypothesis. It seemed as though nature was capable of furnishing astonishing diversity and complexity on its own. During the early twentieth century, physicists added to this line of thinking with the discovery of quantum mechanics. In a quantum mechanical universe, particles can randomly come into being. Coupled with Edwin Hubble's 1929 discovery of galaxies, quantum uncertainty led scientists to the theory of the big bang. These developments are pivotal to the legitimization of scientism and its later denouncement of God because they put the full breadth of the universe into perspective.

In 1933, a group of Unitarian Ministers published *The Humanist Manifesto*. The third thesis of the manifesto rejected mind-body dualism (the idea that the mind and body are separate entities). The whole of human existence had physical, corporeal causation—including the mind. The sixth thesis rejected all "theologies involving a supernatural God."[218] The soul and the divinity were no longer needed. Secular Humanism is important to scientism because adherents to scientism are secularists who do not believe in the mind-body duality or a soul.

[217] Ibid., 374.
[218] Rinaldo, *Atheists…*, 124-125.

After World War II, a consumer-based suburban military-industrial complex culture emerged in the United States. The culture of the military-industrial complex is important to scientism because it is in many ways the materialization of a scientific worldview (advocates of scientism added a positivistic, antireligious ideology). During the 1960s, a new conservative movement unfolded in southern California. Writing in her book *Suburban Warriors* (2001), historian Lisa McGirr claimed that the anticommunist culture of the military-industrial complex caused white, suburban protestant housewives to engage in a grassroots political movement that sat in contraposition to the prevailing liberal counterculture.[219] In the book *The Silent Majority* (2006), Matthew D. Lassiter argued that a center-right conservative movement emerged out of sub-urbanization in the American south and culminated in the normalization of north-south metropolitan structure and national culture. As opposed to focusing on race and reacting to the civil rights movement, white suburbanites insisted that natural market forces caused de facto segregation, therefore implementing a racist policy devoid of the language of race or constitutional constraints.[220]

In 1972, the United States Congress approved the Equal Rights Amendment (ERA) for ratification by the states. The amendment to the constitution required 38 states' ratification and would guarantee equal protection under state and federal law regardless of sex.[221] A Midwestern sprawl of protestant suburban housewives emerged to challenge the amendment. Collectively, conservative anti-ERA forces insisted that the amendment undermined a woman's God given role as a comfortable American woman submissive to her husband.[222]

[219] Lisa McGirr, *Suburban Warriors* (Princeton: Princeton University Press, 2001).
[220] Matthew D. Lassiter, *The Silent Majority* (Princeton: Princeton University Press, 2006).
[221] Ruth Murray Brown, *For a "Christian America"* (Amherst: Prometheus, 2002), 29-31.
[222] Ibid., 40.

In 1977, the anti-ERA movement evolved into the pro-family movement. According to sociologist Ruth Murray Brown, writing in her book *For a "Christian America",* this marked the beginning of the Christian Right in America. Amongst its enemies were the feminists and the humanists.[223] In 1979, Christian fundamentalist Jerry Falwell initiated a campaign to restore "A Christian America" that would come to be known as the Moral Majority.[224] This was obviously propaganda since deists, not theists, founded the United States as a secular nation. The appearance of the Christian Right is important to the story of scientism in the late twentieth and early twenty-first century because it acted as a diametrically opposed force, while simultaneously sharing the culture of the military-industrial complex. Just like scientism of the same era, it grew parallel to the rise of the information age and utilized mass media.

In 1976, English biologist Richard Dawkins published *The Selfish Gene.* Dawkins's book argued that evolution operates by preserving specific genes and not individual organisms. The book undermined supernatural, religious proposals that altruism transcends evolution. Dawkins argued that self-sacrifice itself—altruism—stems from evolution. The sacrifice of an individual can preserve the genes of other individuals, or of a group of individuals.[225] A mother sacrificing herself for her young preserves the genes of her young, and that self-sacrificing tactic is preserved within the genes of the offspring. The idea that Dawkins proposed is important to scientism because it offers a scientific explanation for an important facet of humanity—altruism.

The same decade, Hal Lindsey published *The Late Great Planet Earth* (1970). The book is a literalist interpretation of biblical end-time scenarios. It sold over 30 million copies.[226]

[223] Ibid., 123.
[224] Ibid., 157.
[225] Victor J. Stenger, *The New Atheism* (Amherst: Prometheus Books, 2009), 31.
[226] Ibid., 53.

Americans paid close attention to God, but other forces were at work where the end of the world was concerned.

In 1987, Michio Kaku and Daniel Axelrod published a book—*To Win a Nuclear War*—that suggested the real reason the world could end, and it had nothing to do with God. The book argued that United States nuclear policy was the greatest apocalyptic threat in the late twentieth century. The authors tracked the progression of United States nuclear war strategy from the dropping of the atomic bomb on Hiroshima to when the book was written. Contrary to popular arguments about deterrence and defense, the authors showed that United States nuclear policy has been aggressive from the beginning. They painted President Harry Truman as a nuclear tyrant who advocated an arms buildup. From 1945 to 1950 alone, the US atomic stockpile increased from 2 to 450 weapons. From 1950 to 1957, it increased from 450 to a staggering 5,450. By 1974 the United States possessed 29,000 weapons.[227]

To Win a Nuclear War warned of nuclear war and of public ignorance as to how government has used advances in science towards aggressive, destructive ends. Former United States Attorney General Ramsey Clark wrote the forward and stated that the book made use of leaked and declassified information, interviews with government officials, and Freedom of Information Act disclosures. Part of the reason for public ignorance is that the United States government hid the true aggressive extent of nuclear strategy. Clark concluded that an apocalypse is possible—there is an "unavoidable catastrophe ahead unless there is a radical change and a careful, expeditious elimination of all nuclear arms."[228]

In 2008, theologian John F. Haught responded to the New Atheist movement that emerged in 2004. In his book *God and the New Atheism*, Haught claimed that new atheists

[227] Michio Kaku and Daniel Axelrod, *To Win a Nuclear War* (Boston: South End Press, 1987), x-xi.
[228] Ibid., v.

"Dennet and Dawkins are simply restating one of the central assumptions of all science-inspired atheism." He said that "Carl Sagan…made similar claims."[229] The movement emerged when Sagan began writing popular science books. Since then, it went through a process of radicalization catalyzed by the information age. Sagan's television series *Cosmos* reached over 500 million viewers in 60 countries.[230]

According to philosopher Victor J. Stenger, writing in his book *The New Atheism* (2009), the New Atheism movement began with the publication of Sam Harris's 2004 book *The End of Faith: Religion, Terror, and the Future of Reason*. This book initiated a series of books that take a hard line against religion. Spurred by the violence of the 9/11 terror attacks, Harris's work harshly criticized Christianity, Islam, and Judaism. He was particularly critical of religious moderates who "imagine that the path to peace will be paved once each of us has learned to respect the unjustified beliefs of others." In 2006, Harris wrote *Letter to a Christian Nation* in which he responded to letters from disgruntled Christians angry at his previous work. Dawkins published *The God Delusion* the same year. Daniel C. Dennet published *Breaking the Spell: Religion as a Natural Phenomenon* (2006). And Stenger wrote *God: The Failed Hypothesis* in 2007.[231] All of the books contain arguments for the New Atheist agenda:

> The new atheists are committed to helping accelerate the trend away from religion that is already occurring in certain parts of the world. We ask other atheists and agnostics to join us in taking a harder line against the follies and atrocities of religion produced by its irrational thinking. Not only will a more secular world improve our security by making wars more unlikely, it will allow science and reason to once more help guide government policies, especially in the United States after eight years or more of being ignored in favor of "faith-based initiatives." We see this as the only road to survival.[232]

[229] John F. Haught, *God and the New Atheism* (Louisville: Westminster John Knox Press, 2008), xi.
[230] Stanford University, "Carl Sagan to Lecture at Stanford April 23," *Stanford News Service,* April 12, 1993.
[231] Stenger, *The New Atheism*, 11-12.
[232] Ibid., 17.

This version of the agenda—put forth in 2009 in Stenger's *The New Atheism*—responded to the religious right and the neo-conservatives of the Bush administration (2001-2008) who had lobbied the religious right for support. The statements definitively connect New Atheism with scientism. Only science and reason devoid of religion can properly guide government and ensure survival. This echoes what Sagan and Hawking said over and over for decades. In short, the New Atheism movement is the scientism movement caused by Sagan and Hawking, and they both took part in it.

Stenger and the New Atheists might have self-proclaimed their own movement, but in reality it was a continuation of Sagan and Hawking's already extant program. Prominent New Atheist Christopher Hitchens underlined Hawking's influence in the first chapter of his 2007 book *God Is Not Great*. Alluding to Hawking's 1988 publication of *A Brief History of Time*, Hitchens wrote:

> If you read Hawking on the "event horizon," that theoretical lip of the "black hole" over which one in theory could plunge and see the past and the future (except that one would, regrettably and by definition, not have enough "time"), I shall be surprised if you can still go on gaping at Moses and his unimpressive "burning bush."[233]

During the same year, in a collection of antireligious essays entitled *The Portable Atheist*, Hitchens wrote of Sagan: "A tremendous number of people owe their portion of scientific education to the elegant and witty Carl Sagan (1934-1996)."[234] Hitchens included two of Sagan's pieces: a chapter from *The Demon-Haunted World* and a portion of the Gifford Lectures on Theology. Sagan's widow Ann Druyan published the lectures and sold them as a book authored by Sagan as *The Varieties of Scientific Experience* in 2006 in the midst of the New Atheism movement. In this sense Sagan literally took part in the New Atheism movement.

[233] Christopher Hitchens, *God Is Not Great* (New York: Twelve, 2007), 8.
[234] Christopher Hitchens, *The Portable Atheist* (Philadelphia: Da Capo Books, 2007), 218.

In *God and the Folly of Faith* (2012), Stenger reiterated the impact of *A Brief History of Time*: "In the introduction to *Brief History*, Carl Sagan explicitly summarized Hawking's main proposal: 'A universe with no edge in space, no beginning or end in time, and nothing for a creator to do.'" He claimed that Hawking's book was not just another interesting explanation of advancements in physics, but rather an illuminating suggestion of the true nature of the cosmos. Stenger quoted Hawking, "It is not necessary to invoke God to light the blue touch paper and set the universe going."[235] Taking Sagan's more cautious musings a step further, Hawking was the first adherent of scientism in the late twentieth century to publically propose that the universe required no God. A multitude of others followed.

In Democritus's Shadow

This section claims that string theory allowed for a stronger confidence in the anthropic principle and underlines the relationship between materialism and scientism. It examines atoms and strings through the lens of scientific thema. It also shows how Greene built a linear history of science within his popular works.

Atheism and strings lay in Democritus's shadow. He died thousands of years ago, but his legacy lives on as the thema of atomism transforms over time. He was an atheist who thought that all existence was atoms and the void. Ironically, this view bore striking resemblance to what modern physics tells scientists about the world. Greene's work on string theory deals with an incarnation of atomism as strings. One of the possible implications of string theory—multiple universes—may preclude the need for God. Multiple universes imply the anthropic principle. Nature spontaneously generates infinite universes over and over without the assistance of God.

[235] Victor J. Stenger, *God and the Folly of Faith* (New York: Prometheus, 2012), 190.

Only in those suitable to life does life evolve. String theory is important to turn-of-the-twenty-first-century scientism because it provides a framework for a unified theory that excludes God. It legitimizes the New Atheist's antireligious platform. Similar to Sagan and Hawking, Greene built a history of science from Democritus to the present. Concerning Sagan, Greene stated:

> He was a trailblazer, and he's been a model for me. Lots of us who are interested in explaining science to the public view Carl as an iconic hero.[236]

In the book *The Elegant Universe* (1999), Brian Greene claimed that "physicists by their nature will not be satisfied until they feel that the deepest and most fundamental understanding of the universe has been unveiled," and that, "This is what Stephen Hawking has alluded to as the first step toward knowing 'the mind of God.'"[237] *The Elegant Universe* gave the reader a detailed account of string theory. If the theory is correct, it would successfully unite the relativistic world with the world of the quantum. Therefore, it is known as a unified theory. According to Hawking, "M-theory [string theory] is the unified theory Einstein was hoping to find."[238] Physicist Freeman Dyson, writing in *The Scientist as Rebel* (2006), said string theory could be correct, but added, "Progress in science is often built on wrong theories that are later corrected."[239] Dyson also said that Greene excels at explaining difficult ideas and that the book offered a historical path from Newton and Galileo to Einstein and Hawking.[240]

Greene stated that Einstein's thoughts concerning relativity drew from the insights of Galileo. There is no way to do an experiment on a train, or boat in Galileo's case, in a closed compartment and know whether or not the vehicle is in a state of constant-velocity motion.[241]

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[236] Michael D. Lemonick, "Mastering the Cosmos in Four Hours or Less," *Time*, December 1, 2011.
[237] Brian Greene, *The Elegant Universe* (New York: Norton, 1999), 117.
[238] Hawking, *The Grand Design*, 181.
[239] Freeman Dyson, *The Scientist as Rebel* (New York: New York Review of Books, 2006), 214-215.
[240] Ibid., 214.
[241] Greene, *The Elegant Universe*, 30.

Greene discussed the work of the Scotsman James Clerk Maxwell as a precursor to Einstein's work. He pointed out that Newton closely examined the work of Johannes Kepler and then discussed how Newton described the effects of gravity mathematically, but never really showed its true nature. Einstein sought to resolve this problem while developing the theory of relativity.[242] In explaining this history, Greene's book bore similarity to Hawking's *A Brief History of Time* in that it is necessary to explain the history of scientific ideas before possibly explaining the main subject matter of the book—string theory. Like black holes and the big bang, string theory represents the culmination of centuries of scientific endeavor. Greene communicated this message of the progress of science within his popular works, a strategy first utilized by Sagan and Hawking. A progressive history of science is an important facet of scientism.

The historical path within *The Elegant Universe* began earlier than the seventeenth century. "The ancient Greeks surmised that the stuff of the universe was made up of tiny uncuttable ingredients they called atoms." And "More than 2,000 years later we still believe it to be true…."[243] Greene explained how nineteenth century scientists discovered the smallest constituents of elements and followed the Greek tradition by calling them atoms. The Greek's atoms have gone through many revisions over time. "The name stuck, but history has shown it to be a misnomer, since atoms are surely 'cuttable.'"[244] Scientists of the early twentieth century discovered the moving parts of the atom, and the indivisible pieces grew smaller. Greene's explication is a good example of Hawking's model-dependent realism and how the thema of atomism has been transformed throughout history.

[242] Ibid., 54-57.
[243] Ibid., 7.
[244] Ibid.

String theory would transform the thema of atomism once more. As things stand at the moment, the standard model of physics predicts the existence of fundamental particles like quarks, electrons, and gluons that combine to form atoms. These atoms absorb and transmit photons as all forms of electromagnetic radiation—visible light, microwaves, x-rays, gamma rays. Neutrinos permeate the universe in a nonreactive manner. String theory would turn these indivisible pieces into filaments of energy, transforming the thema of atomism into something more harmonic. More shockingly, however, string theory would unite relativistic and quantum equations into a unified theory thought to explain all physical phenomena, from black holes and the big bang to a baseball coming off a bat. Greene and the string theorists would then stand triumphantly at the apex of human knowledge and understanding of the universe. A unified theory would strongly reinforce scientism because then adherents to scientism could confidently say they understand all of the laws of the universe and that God has nothing to do with any of it.

Atomism is not the only thema Greene touched upon. Einstein shattered over two-thousand years of plane geometry when "he realized that the familiar geometrical spatial relationships codified by the Greeks , relationships that pertain to 'flat' space figures like a circle on a flat table, do not hold from the perspective of an accelerated observer." Accelerated motion "results in a warping of space."[245] Einstein disturbed the thema of space and time in a manner that defies most people's intuitive thoughts. Before Einstein, space and time were thought to provide a flat inert area for events to unfold.[246] Relativity shows that massive bodies and bodies in accelerated motion alter the flat geometry of space and time. His work fused the two together as space-time.

[245] Ibid., 65.
[246] Ibid., 68.

Between Greene's first and second book, just months before the 9/11 terrorist attacks, President Bush declared that he had no intention of signing the Kyoto treaty—an international agreement that limits greenhouse emissions and could help to curb anthropogenic global warming. Bush cited economic concerns as the greatest deterrent to signing the accord.[247] The treaty would limit the economic output of the United States, which would in turn cut corporate profits. Bush showed his adherence to corporate interests again in 2003 with the privatization of the war in Iraq and the subsequent issuance of oil contracts to British and American companies.[248] After the success of his second book, Greene would become more outspoken in the climate debate.

As Greene was writing a book that lauded science, popular culture still emitted negative critiques of science. A year after the terrorist attacks, Mila Jovovich starred in *Resident Evil* (2002). The film, an adaptation of a 1990s PlayStation game of the same title, was a harsh critique of corporate America, the neo-conservatives, and the growing biomedical industry. Jovovich's character, Alice, works for a megacorporation aptly titled Umbrella Corporation. Umbrella, which bears striking similarity to Halliburton—both in its breadth and its military wing—engages in dangerous bio-weaponry research. After an outbreak of the "T-virus" from a secret underground facility known as the hive, Alice finds herself in a life or death situation with infected individuals who have degraded to a violent, primal, zombie-like state. Alice escapes the hive only to be captured by Umbrella soldiers.[249] In the 2004 sequel to the film, *Resident Evil: Apocalypse*, Umbrella detonates a nuke over Raccoon City to control the outbreak of the T-

[247] David E. Sanger, "Bush Will Continue to Oppose Kyoto Pact on Global Warming," *New York Times*, June 12, 2001.
[248] See Naomi Klein's *Shock Doctrine* for a more detailed explanation.
[249] *Resident Evil*, directed by Paul W.S. Anderson (Munich: Constantin Film, 2002).

virus.[250] The movies foresaw the looming dangers of genetic engineering and corporate power, especially when corporations wield powerful science and private armies. They are relevant to scientism because they portrayed a world dominated by corporate scientism. The second movie was released in a time when private contractors (mercenaries) operated in Iraq. They illustrated the end product of the 1980s privatization program of the military-industrial complex—neoconservatives aligned with corporate power.

That same year, Greene discussed the nature of space and time in great length in his second book, *The Fabric of the Cosmos* (2004). The book began with historical explanations of space. "Democritus, Epicurus, Lucretius, Pythagoras, Plato, Aristotle, and many of their followers through the ages wrestled in one way or another with the meaning of 'space.'"[251] They asked many questions about the nature of space. When Christianity arose, the questions became theological in nature. Greene asserted that for over a thousand years philosophical questions concerning space intertwined with religious thought. "God, according to some, is omnipresent, an idea that gives space a divine character." Newton believed this and filled space with a spiritual substance declaring: "Absolute space is the sensorium of God."[252]

Newton did not stand unchallenged, however. Gottfried Wilheim von Leibniz questioned Newton's conclusions. He claimed that space had no physical meaning without different objects to define relationships of location. He also questioned how God, who is perfect, could choose where to place the universe against a backdrop of void empty space. Greene admitted that this might sound silly to the scientifically minded, but if one removes God, as Leibniz did in certain forms of his argument, then profound questions concerning the nature of the universe arise. For

[250] *Resident Evil: Apocalypse*, directed by Alexander Witt (Munich: Constantin Film, 2004).
[251] Brian Greene, *The Fabric of the Cosmos* (New York: Vintage, 2004), 29.
[252] Ibid.

instance, if the whole universe were to move, would it move against the backdrop of space, or is it impossible to move the entirety of everything since it cannot move relative to itself? Newton won the day, however. He proved, with a bucket of water, that something like absolute space existed. He carried out an experiment in which he spun the bucket and then watched as the water formed a spinning vortex. This, Newton declared, was absolute motion against absolute space.[253]

Greene brushed up against the conflict between Newton and Leibniz that Alexandre Koyré expounded upon in his book *From the Closed World to the Infinite Universe* (1957). Koyré wrote a detailed account of Newton and Leibniz's epic battle concerning the true nature of space. The scientific advancements of the seventeenth century sought mechanical explanation for all phenomena. Newton excelled at this when he developed the inverse square law of gravity. He stopped short of pure mechanism, though, when he permeated absolute space with a God that acted as the force between celestial bodies. Leibniz cried foul: How could you come this far and in the last connection between the planets evoke God as the mechanism? Newton's view required an ever-present God who would occasionally wind the cosmic clockwork. Leibniz preferred a God who had set the cosmos in motion once and then did not intervene.[254] To Leibniz, Newton's assertion of space as the sensorium of God and inclusion of God as the final mechanism of action between celestial bodies was an unacceptable conclusion in the quest for a mechanical, scientific philosophy. Koyré describes Leibniz's views as follows:

> I objected, that an Attraction, properly so called, or in the Scholastic Sense, would be an Operation at a distance, without any Means intervening. The Author answers here, that an attraction without any means intervening would be indeed a Contradiction. Very well! But then what does he mean, when he will have the Sun to attract the Globe of the Earth

[253] Ibid., 30-31.
[254] Alexandre Koyré, *From the Closed World to the Infinite Universe* (Baltimore: John Hopkins Press, 1957), 141.

> through an empty Space? It is God himself that performs it? But this would be a Miracle, if ever there was any. This would surely exceed the Powers of Creatures.[255]

Clearly, Leibniz did not want to mesh God with the mechanical, scientific functioning of the universe. He knew something was not right. Newton triumphed for the moment, but in the end, Leibniz's suspicions were not without warrant. Einstein proved God an unnecessary factor and that gravity does indeed have a mechanical cause—the warping of space-time. Leibniz's argument against Newton illuminates scientism in the seventeenth century. He sought a purely mechanistic cause for gravity and was clearly distraught when Newton reintroduced God. The existence of multiple universes—a possible implication of string theory—could end the debate.

Parallel Worlds, Lone Earth

This section claims that the New Atheists used the anthropic principle throughout multiple popular works as a legitimization of their denouncement of God and to push a scientific worldview. Coinciding with the New Atheist movement that began in 2004, a multitude of books delineated the specifics of the anthropic principle. Kaku, Dawkins, and Greene all spoke of the anthropic principle in a manner that precluded the need for a creator. Although multiple worlds existed in their models, only one Earth exists, and they warned of impending environmental threats. These popular science books were additional ammunition for the New Atheist movement. Greene expressed an affinity for New Atheism while critics of religion like Bill Maher openly released a documentary offensive to those of religious belief. The Christian Right fired back at non-believers and the election of President Obama with the foundation of the Tea Party movement.

[255] Ibid., 157.

Kaku revered Sagan to such an extent that he used Sagan quotes to introduce several chapters. One such introduction appears in *Parallel Worlds* (2005), where Kaku speculated about the possibility of multiple universes. The book discussed the anthropic principle. The anthropic principle states that humans find themselves in a universe suitable for life because that is the only universe where humans could have evolved. Kaku concluded that just because all of the pieces for life seem to fit "does not necessarily mean that God has bestowed a special blessing on us; it might simply be a coincidence…"[256] He quoted Democritus during his discussion of the anthropic principle—"There are worlds infinite in number and different in size… Some worlds are destitute of animal and plant life and of all moisture."[257] Kaku used the anthropic principle to question the existence of God.

Richard Dawkins elaborated upon the anthropic principle in his 2006 book *The God Delusion*. He followed Sagan's lead:

> All Sagan's books touch the nerve-endings of transcendent wonder that religion monopolized in past centuries. My own books have the same aspiration.[258]

The scientist harshly refuted religion and the existence of a supreme being throughout the work. Dawkins talked about the idea and argued that the anthropic principle "provides a rational, design-free explanation for the fact that we find ourselves in a situation propitious to our existence."[259] He claimed that two explanations exist for why humans find themselves in a place that supports life. One is God, the other is the anthropic principle.[260]

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[256] Michio Kaku, *Parallel Worlds* (New York: Anchor, 2005), 244.
[257] Ibid., 244-245.
[258] Richard Dawkins, *The God Delusion* (New York: Mariner, 2006), 33.
[259] Ibid., 164.
[260] Ibid.

Dawkins explained why the conditions on Earth and the universe as a whole do not suggest a supreme being into two separate facets of the anthropic principle. He stated that even though it could be exceedingly rare that life began on Earth (the formation of chemical elements into organic molecules that multiply themselves requires specific, perhaps rare conditions), many planets fill the universe and conditions may be ripe for life on many of them. Since there are about a billion billion planets in the universe, if only one out of a billion contained life that would still amount to one billion planets. No being designed any single planet for the ability to have life, the conditions sprang by chance from the sheer numbers. Dawkins referred to this as the planetary version of the anthropic principle. The cosmological version appears exactly the same except that instead of planets, entire universes are used. Again, no supreme being endowed a single universe with the properties to support life. The infinite number and variety simply meant that a narrow few potentially could.[261] "We live not only on a friendly planet but also in a friendly universe."[262] Dawkins used the anthropic principle as a weapon to candidly state that God does not exist.

Also in 2006, Dawkins founded the Richard Dawkins Foundation for Reason and Science. The organization's mission is to promote a scientific worldview and undermine religion and superstition. The organization's website, *www.richarddawkins.net*, provides the latest news in science's war on religion. It also hosts an anti-discrimination support network for atheists who have been marginalized by the world's religious majority.[263]

[261] Ibid., 165-170.
[262] Ibid., 169.
[263] Richard Dawkins, Richard Dawkins Foundation, accessed June 20, 2014, www.richarddawkins.net.

There may be multiple universes, but there is only one earth accessible to humans. Because of this, Greene became an environmentalist. A 2007 interview explained the origins of a facet of Greene's environmentalism. Greene became a vegetarian when he was a child:

> I became vegetarian when I was nine because my mother cooked spare ribs in a manner that made the connection to meat from an animal particularly clear. So at that point I said I'm never eating meat again and proceeded to go to the refrigerator and make a salami sandwich, because, a city kid, you know, what is meat? You don't know what meat is, really. And my parents said, "Well, that salami is meat," at which point I just put down the sandwich and never ate meat again.[264]

Later, Greene became a vegan after he visited an animal sanctuary and learned about the dairy industry. He said, "I did eat dairy for a while until I went to an animal sanctuary in Upstate New York and learned all sorts of things about the dairy industry, which, frankly, I was happy not to know. But once I did, I couldn't go back."[265]

During the same interview, Greene joked that the belief that God created the universe was the greatest conspiracy theory. He alluded to issues of a scientifically illiterate public:

> What's ignored in conversations [currently preoccupying the world]—climate changes, global pandemics, stem cells—is often the underlying science, which can really inform the conversation and help it to go down very different directions. What's missing in the public discourse is for science to be tightly woven into the cultural tapestry, so that it's not viewed as something separate, but something fully integrated into the way we think.[266]

Echoing Sagan, Greene insinuated that a culture that does not understand science will have trouble understanding current issues like global warming. Hence, the political dispute surrounding something purely scientific. Greene joked about the existence of God and implied that only science can fix global problems.

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[264] Jamie Friddle, "Brian Greene on the Theory of Everything," *Common Ground*, October 2007.
[265] Ibid.
[266] Ibid.

In a 2008 *New York Times* article entitled "Put a Little Science in Your Life," Greene commented about the place of science in the public mind. He said science can play a role "in giving life context and meaning." With the technology of today, science directly affects quality of life. Greene insinuated that it is important that people understand science to be able to face global challenges. "When we assess the state of the world, and identify looming challenges like climate change, global pandemics, security threats and diminishing resources, we don't hesitate in turning to science to gauge the problems and find solutions." When humans face both problems and opportunities of the future, "we realize how crucial it is to cultivate a general public that can engage with scientific issues."[267] Greene's comments warned of problems such as global warming and a scientifically illiterate public. He insisted that humans rely on science to solve problems and that more people should understand science in order to confront global problems.

The same year, Bill Maher starred in a documentary that chronicled the state of religion in the early twenty-first century. *Religulous* (2008) was a scathing critique that underlines the ridiculousness (religulousness) of belief in a time of such scientific knowledge. It was simultaneously a stab at the religious right during the end of the Bush Administration. Throughout the film, Maher confronted people's beliefs using rational arguments. Maher came off as slightly offensive and highly irreverent.[268] His documentary acted as another barb in the New Atheism scientism movement.

New York City hosted the first World Science Festival in 2008. One hundred thousand people attended and every ticketed event sold out.[269] Speakers included cofounder Brian

[267] Brian Greene, "Put a Little Science in Your Life," *New York Times*, June 1, 2008.
[268] *Religulous*, directed by Larry Charles (Santa Monica: Lionsgate, 2008).
[269] John Tierney, "Hit Science Show Renewed for 2009," *New York Times*, June 4, 2008.

Greene. The event has been held annually in NYC since its inception and attendance has grown every year. In 2013, over 200,000 people attended.[270]

One of Greene's other books is more simple, but that is because he intended it for children. Its theme, however, suggested human space exploration, possibly to avoid earthly threats. *Icarus at the Edge of Time* (2008) revolved around a black hole and principles of time dilation related to relativity. In Greene's rendition of the ancient Greek fable, Icarus travels on the interstellar spacecraft *Proxima* to the nearest star, Proxima Centauri. Proxima's journey takes generations and many live and die on the trip. Icarus's great-grandfather began the mission. One artificial day, the Proxima encounters an uncharted black hole. Icarus decides to leave the Proxima and pilot a shuttlecraft to investigate. He flies too close to the sun[271] (black hole) and falls into the deep gravity well of the black hole. Icarus emerges minutes later to a world ten thousand years in the future. A stream of interstellar traffic crosses where he left the Proxima. Icarus fell victim to time dilation (an implication of the theory of relativity) and emerges much later to witness the product of the Earth mission to Proxima Centauri—an interstellar society of different planets colonized by Earth.

Greene's final words on this society resembled Sagan's optimistic views on space exploration:

> As Icarus watched the presentation, stunned, he learned about the Proxima's successful conclusion of its journey, some ten thousand years earlier, and the grand and fruitful era of interstellar cooperation that followed. He read about the formation of a galactic government and Earth's role as the galactic court, settling disputes and ensuring a lasting peace. And he read about the extraordinary discoveries in his favorite fields of physics and cosmology.[272]

[270] Claudia Santino, "The World Science Festival 2014," *Mrs. Robinson*, May 8, 2014.
[271] In the original fable, Icarus flies too close to the sun.
[272] Brian Greene, *Icarus at the Edge of Time* (New York: Knopf, 2008).

Kaku repeated ideas about multiple universes in his 2008 book *Physics of the Impossible* when he said there is either a God "or there are billions of parallel universes, many of them dead."[273] *Physics of the Impossible* exposed potential technological capabilities of the future (i.e., invisibility suits, phasers). When discussing invisibility, Kaku referred to historical instances of the idea. "The Greek hero Perseus was able to slay the evil Medusa armed with the helmet of invisibility," and "Invisibility played a central part in Plato's theory of ethics and morality."[274] Concerning beam weapons, Kaku insisted that, "The concept of using rays as a practical weapon probably began with the work of the great Greek mathematician Archimedes…."[275] The Greek God Vulcan created robotic maidens and, "As early as 400 BC the Greek mathematician Archytas of Tarentum wrote about the possibility of making a robot bird propelled by steam power."[276] Kaku played upon the ancient lineage of science while again using the anthropic principle to undermine the concept of God.

In reaction to the election of President Obama, in 2009 a group of radical conservatives aligned with the Christian Right to found the Tea Party movement. The Tea Party also arose out of the Wall Street collapse of 2008.[277] They attempted to reconstruct history, insisting that the United States was founded as a Christian nation whose secular government was only endowed with limited powers.[278] The Tea Party's views fit nicely with those of the rest of the Christian Right who sought to restore America as a Christian nation.

Also in 2009, *Star Trek* once again appeared as a modernist manifestation of science fiction. This time the franchise rebooted the original series in a movie entitled *Star Trek*. Chris

[273] Michio Kaku, *Physics of the Impossible* (New York: Anchor, 2008), 241.
[274] Ibid., 17.
[275] Ibid., 35.
[276] Ibid., 104.
[277] Ronald P. Formisano, *The Tea Party* (Baltimore: John Hopkins University Press, 2012), 51.
[278] Ibid., 52-53.

Pine starred as Captain Kirk and he and the Enterprise saved the Federation one more time.[279] *Star Trek* remained an enduring positivistic critique of science.

In 2010, Dawkins interviewed Hawking in an episode of the television series *Genius of Britain*. The two discussed God and the origin of the universe. Hawking stated that the multiverse explains how all of the elements for the evolution of life came together and suggested it as an alternative to God: "Only in the small number of universes that are suitable will intelligent beings develop and be able to ask the question—why is the universe so carefully designed?" This is the anthropic principle. Dawkins listened attentively as though he had not explained the concept in depth in his 2006 book. Hawking asked Dawkins, "Can one assume that insects and bacteria will survive us if our so-called intelligence leads us to destroy ourselves by nuclear war or other disasters?" Speaking of verbal intelligence Dawkins answered, "It seems to work very well for us of course and we're doing very well, we're overpopulating the planet with it. But if we go too far with it and destroy ourselves and destroy much of life, then of course you are right, that other ways of survival will take over, bacteria prominent among them." Hawking also asked Dawkins why he was so obsessed with God, and Dawkins responded, "I noticed that you brought up the question of God and I didn't (*A Brief History of Time*)." After the interview the guest narrator, David Attenborough, claimed that in the near future there would be major problems—climate change, over-population, and the need for more energy. Attenborough concluded, "Science will produce the answer. What the answer will be, I don't know, but I'm perfectly certain that it is science that will find it for us."[280]

Dawkins's interview with Hawking illustrated several key points. First, it was obviously orchestrated to once again explain the anthropic principle as a reason to deny God. Second, it

[279] *Star Trek*, directed by J.J Abrahams (Hollywood: Paramount, 2009).
[280] *Genius of Britain*, directed by Jonathon Rudd and Christopher Sykes (Glasgow: IWC Media, 2010).

showed that Dawkins's acknowledged Hawking as the progenitor of the popular denouncement of God. Last, it reinforced the fact that there would be problems in the future, but that science—according to adherents of scientism—would find answers to the problems.

In a 2011 *Time* article, Greene's ideas about climate change and science within public discourse were again brought to the fore. Greene stated, "…everything from climate change to nanotechnology to genetically modified foods to costly spaceflights involves scientific issues. I think we can help create a cultural shift where science isn't seen as an esoteric subject but rather as part of a full life, central to participation in the democratic process." Greene co-founded the annual World Science Festival held in New York City to help create that cultural shift.[281] The World Science Festival acted as yet another prong in the scientism movement's attack, this time in an open public venue in a large metropolitan center.

Greene further solidified his position on climate change in a 2011 interview. When asked about climate sceptics and whether or not science was a belief system like any other, Greene answered, "When it comes to climate change . . . [and] the preponderance of data is pointing in a given direction, your confidence needs to rise proportionate to that. The data is very convincing." Greene also spoke of the place of God in science. He used the God of the gaps argument. His comment describes what occurred in the seventeenth century when Newton could not find a mechanical process for gravity, so he inserted God. "If science hasn't given an explanation for some phenomenon, you could step back and say, 'Oh, that's God.' Then, when science does explain that phenomenon—as it eventually does—God gets squeezed out."[282] In a separate interview the same year with the *Oxonian Review*, the interviewer asked Greene what he thought

[281] Michael D. Lemonick, "Mastering the Cosmos in Four Hours or Less," *Time*, December 1, 2011.
[282] Helen Lewis, "In science, you've got to go against what the elders are saying," *New Statesman*, June 9, 2011.

of "new atheism." Greene responded, "There's much in it that resonates with me because I personally don't find the need to invoke religious explanation."[283]

In a 2011 CNN news brief, Kaku insisted that global warming causes storms and violent swings in the weather. Snowstorms in the northeastern United States prompted the physicist to write. Kaku admitted that cold weather seems an odd product of global warming, but that physics describes it well. He explained that, "the main consequence of global warming is not warming at all but instead increasingly violent swings in the weather, with droughts and famine in one area occurring at the same time as flooding in another, and snowstorms in one region at the same time as hot spells in another." Kaku continued, "And as the Earth continues to heat, it means that there will be more moisture in the air to possibly drive more monster storms and hurricanes, simultaneously with droughts and hot spells. So we might expect more unusual, bizarre weather patterns in the future. And unless something is done about it, get used to it."[284] Kaku's writing recognized the detrimental effects of global warming and suggested that people do something to stop it.

In Kaku's *Physics of the Future* (2011): "The problem today is that jealousies and hatreds between nations could unleash a nuclear Ragnarok" (the mythical Viking end times battle).[285] The hateful Norse God Loki created mischief wherever he went and incited the last battle between good and evil. Humans in the twenty-first century act just as bellicose as Vikings of the ninth century. Their aggressive genes still express themselves. Kaku's words resembled Hawking's warning that the acquisition of nuclear arms by minor powers could destabilize the

[283] Josh Rosaler, "An Interview with Brian Greene," *Oxonian Review*, April 4, 2011.
[284] Michio Kaku, "Monster snowstorms still spell global warming," *CNN*, January 28, 2011.
[285] Michio Kaku, *Physics of the Future* (New York: Anchor, 2011), 257.

geopolitical atmosphere and lead to nuclear war. He cautioned, "The danger is that nuclear weapons technology will proliferate into some of the most unstable regions of the world."[286]

New technologies further increase the risk that other nations will acquire nuclear weapons. Ultracentrifuges made uranium enrichment a much easier process. This technology enabled Pakistan to create nuclear weapons around 1998 and resulted in a nuclear rivalry with India. Kaku warned that the potentiality of nations acquiring weapons may increase further in the twenty-first century with the development of laser enrichment technology. "Unless we control this technology, the bomb will continue to proliferate, perhaps even to terrorist groups."[287]

Concerning global warming, Kaku declared that "scientists have concluded with 90 percent confidence that global warming is driven by human activity, especially the production of carbon dioxide via the burning of oil and coal."[288] In the past 50 years, the Arctic ice sheet has decreased by 50 percent. Pieces of Antarctica's ice that have been frozen for thousands of years are breaking off. Greenland's ice is shrinking, too. All of this melting ice causes sea levels to rise. A study conducted by the University of Colorado said that by 2100, sea levels could rise three to six feet. Increasing temperatures also mean the spread of tropical diseases to more northern latitudes.[289]

A passage in Greene's third book, *The Hidden Reality* (2011), suggested further that God has no place within the cosmos. The book explained the latest advances in physics and how they hypothesize the existence of parallel universes. The conglomeration of these universes make up the multiverse. Greene first pointed to the successive diminution of the human position within

[286] Ibid.
[287] Ibid., 258-260.
[288] Ibid., 263.
[289] Ibid., 261-262.

the cosmos (in a manner strikingly similar to the way that Sagan delivered the same idea decades before). According to Aristotle and classical Christian theology, the Earth existed at the center of the universe. The sun revolved around the Earth. Aristarchus first made speculations about heliocentrism in the ancient world, but the ideas of Aristotle overshadowed his thoughts. The Christian establishment propagated Aristotle's position because it put God's creation—Earth and man—at the center. Greene claimed that Nicolaus Copernicus's heliocentric model is the first sound example of a scientific endeavor that removed humans from the center of the universe. "We now realize that Copernicus's result is but one of a series of nested demotions overthrowing long-held assumptions regarding humanity's special status: we're not located at the center of the solar system, we're not located at the center of the galaxy, we're not located at the center of the universe…."[290] Scientists refer to this idea as the Copernican principle.

Even if the Earth revolves around the sun and has no special position within the universe at large, why does life exist on the planet—why is it that Earth has the right amount of water and chemical elements and sits at the precise position from the sun to contain liquid water? Greene showed that the answer to this is simple. The universe contains a multitude of stars and planets, and that some planets happen to sit at the right distance from their star for life to evolve. The question becomes more complicated, though. Proponents of intelligent design may argue, this is true, but why is it that the universe contains the exact laws necessary for the evolution of life on planets?

To answer this question, Greene drew upon the work of an Australian physicist named Brandon Carter. In the 1970's, Carter presented an interesting idea at a conference in Poland. Carter said that the reason we find a universe fine-tuned for life is because that is the only

[290] Brian Greene, *The Hidden Reality* (New York: Vintage, 2011), 167.

universe where we could have evolved. Multiple universes may exist, but humans only find themselves in a universe where the laws support our form of life. Greene called the anthropic principle, "a tantalizing twist to the Copernican principle."[291] Multiple universes and the anthropic principle demote the human position within the cosmos and negate notions of a divine being that intelligently designed things because humans inhabit no special universe and the majority of universes probably do not support life. The universe, like Earth, becomes one of many scattered among lifeless rocks. Greene's advocacy of the anthropic principle was yet another example of the New Atheism scientism movement using the anthropic principle to attack God.

In 2013, Dawkins and Krauss (*The Physics of Star Trek*) took the lead roles in a documentary entitled *The Unbelievers*. The two traveled the world arguing with the faithful and fraternizing with likeminded people such as Stephen Colbert. The movie also covers the 2012 Rally for Reason where 30,000 atheists gathered in Washington, DC. Dawkins and Krauss both spoke to the crowd. During the film, Dawkins stated that he hopes that in the future it would not be necessary to have the term atheist and that it would be taken for granted that people no longer believe in ancient myths. He suggested that religion may be in the beginning of its "death throes," fighting to survive. Dawkins quoted Sagan in a conversation with Krauss, giving explanation to their actions: "Carl Sagan said, when you're in love, you want to tell the world. Saying that I'm in love with science and I have to tell the world." Krauss utilized the anthropic principle by claiming that the multiverse now served the purpose of the prime mover—God.[292] The short film is another weapon of the radical early twenty-first century scientism movement.

[291] Ibid., 168-172.
[292] *The Unbelievers*, directed by Gus Holwerda (Phoenix: Black Chalk, 2013).

In 2014 astrophysicist Neil deGrasse Tyson, one of Sagan's disciples, starred in the updated television series *Cosmos*. During the show, Tyson described the origins of his scientific transformation. In 1975, he met Carl Sagan when he was only 17. Sagan invited him to tour Cornell and gave Tyson a copy of his book *Cosmic Connection*. Of the meeting, Tyson stated:

> I already knew I wanted to become a scientist, but that afternoon I learned from Carl the kind of person I wanted to become. He reached out to me and to countless others. Inspiring so many of us to study, teach, and do science. Science is a cooperative enterprise, spanning the generations.[293]

The religious right has since criticized Tyson and the show for embracing a scientific worldview that ignores the creationist argument and advocates evolution.[294]

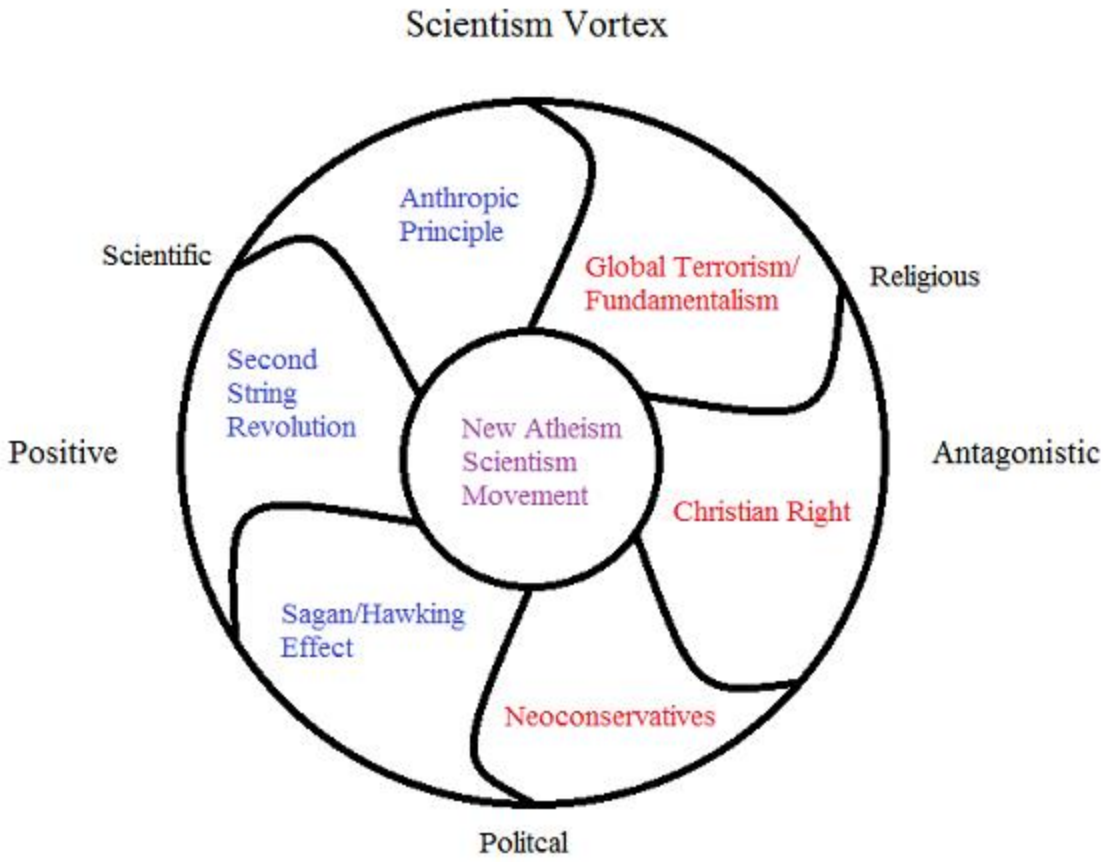
Conclusion

Throughout their works, scientist popularizers like Greene, Kaku, and Dawkins communicated a radical twenty-first century scientism that undermined God and religion. Sagan's influence informed all of their works. They all—including Hawking—participated directly and indirectly in the New Atheism movement that responded to religious right groups such as the Tea Party conservatives. Even Sagan took part posthumously with Druyan's publication of his Gifford Lectures within *Varieties of Scientific Experience*, portions of which were used in Hitchens's *The Portable Atheist*. When science failed to answer a question, God could fill in until science caught up and responded with powerful ideas such as the anthropic principle—a keystone in the New Atheist argument that negated the need for a fine-tuning creator. Simultaneously, Greene and Kaku warned of extant threats caused by the previous

[293] Jennifer Welsh, "Neil deGrasse Tyson Describes his Life-Changing First Encounter with Carl Sagan," *Business Insider*, March 9, 2014.
[294] Sean McElwee, "Neil deGrasse Tyson vs. the Right: "Cosmos," Christians, and the Battle for American Science," *Salon*, May 26, 2014.

century's Cold War and hyper-industrialization—global warming and the existence of thousands of nuclear weapons. Kaku illustrated the threat posed by nuclear weapons and declared evidence for anthropogenic global warming is indisputable. Despite the obstacles, Greene's confidence in science led him to a prescient vision of human life in space within the pages of a children's book. He recognized the dangers of a scientifically illiterate public and further pushed his worldview by cofounding the World Science Festival. He spoke out against food production practices by becoming a vegan and warned of climate change. There would be problems in the future, but as Attenborough said in *Genius of Britain*, science would find the answer (this may or may not be true).

The New Atheism scientism movement might have been the culmination of the radicalization of scientism coinciding with other factors to form a scientism vortex. Like a real vortex, a scientism vortex forms when certain elements coalesce to form a movement—in this instance, scientific, political, and religious elements. (One might have occurred in seventeenth century Europe as well.) Scientifically, the second string revolution and the anthropic principle added to the vortex. Politically, the Sagan/Hawking effect and the neoconservatives contributed. Religiously, the Christian Right and global terrorism/fundamentalism played a role. The neoconservatives, the Christian Right, and global terrorism acted as antagonistic forces. The second string revolution, the anthropic principle, and the Sagan/Hawking effect acted as positive forces. Below is a graphic that represents this dynamic:



Analysis and Conclusion

Conceptual Explanation

After World War II and the dropping of atomic bombs over Japan, the United States had an unprecedented faith in science. Science fiction writers like Isaac Asimov wrote books that posited a strong scientific worldview. Arthur C. Clarke foresaw the creation of a global satellite network based on German V2 technology. Scientists who had worked on the Manhattan Project felt differently, however. They feared the misuse of nuclear power and sought to establish international control of nuclear energy. They established the Atomic Scientists Movement to pursue their goals, but factions tied to the emerging military-industrial-academic complex derailed them. McCarthyism, armed with help from the FBI, silenced dissenting scientists who advocated internationalization of nuclear energy. The security state eventually silenced Oppenheimer for his criticism of nuclear weapons projects such as the hydrogen bomb. During this time, sociologists noticed an underlying essence of scientism among scientists.

In 1957, the Soviet Union launched the world's first artificial satellite—Sputnik. The launch alarmed citizens and the government of the United States. President Eisenhower knew that he had to reorient the place of science in policy. To do so, he created PSAC. Whereas the Atomic Scientists Movement was silenced for voicing political opinions, PSAC informed the actions of the President on scientific matters.

As the White House integrated science back into policy, the early 1960s saw a deterioration of the popularity of science in the public sphere. In 1962, Rachel Carson published *Silent Spring* and launched the environmental movement. After President Kennedy was assassinated in 1963, President Johnson escalated the Vietnam War. Both the environmental

movement and the Vietnam War caused a loss in America's faith in science. At the same time, protests took place on college campuses throughout the United States to protest Department of Defense funds on college campuses. By the time Nixon eliminated PSAC in the early 1970s, science had lost credibility in policy. Postmodern science fiction emerged that negatively critiqued science.

Simultaneously, a modernist bent existed within certain facets of popular culture and within the minds of certain scientists. *Star Trek* debuted in 1966, and the show exhibited a positivistic scientific worldview. Carl Sagan, echoing the internationalism of the Atomic Scientists Movement, wrote a book about the possibilities of extraterrestrial life with a Soviet scientist. Sagan met Asimov and Clarke; science fiction informed science and science informed science fiction. During this period, Americans were excited about space. They landed on the moon in 1969. Modernism and postmodernism sat side by side as opposing critiques within popular culture, but also within the very real world of Apollo rockets, protests on college campuses, and a war in Southeast Asia.

As the Cold War lingered on and American faith in technology dwindled, Sagan began to write a series of politically charged books that pushed a scientific worldview. In the 1970s, he wrote *Cosmic Connection* and *Broca's Brain* where he warned of global warming and nuclear war, and used the rhetoric of the Cold War to advocate joint American-Soviet space exploration. During the same decade, he worked on NASA's Voyager project. Upon Sagan's request, President Carter wrote a message on Voyager's gold disc. In 1980, Sagan starred in *Cosmos* and wrote an accompanying book. Sagan sought to spark an interest in science and delivered a history of science in which the scientific method prevailed over religion and superstitious thinking. Concurrently, a radical right Christian movement emerged out of the pro-family

movement of the 1970s. This movement culminated in the 1980s Moral Majority movement of fundamentalist Christian Jerry Falwell.

As the tech-boom of the 1980s and President Reagan's radical conservatism sparked the "second Cold War," late twentieth century scientism grew parallel to the emerging information age. It also grew parallel to the Christian Right that opposed it, illustrated in the backlash against Hawking's questioning of God. Scientific ideas flowed through the ARPANET and global satellite networks. Ideas about God proliferated through mass media. Meanwhile, Sagan and a group of scientists discovered nuclear winter. They wrote two books warning of the phenomena and announced that their work had influenced President Reagan. Sagan acquainted himself with Stephen Hawking and wrote the introduction to Hawking's first popular book *A Brief History of Time*. The two starred in a documentary celebrating the book with science fiction writer Clarke where they discussed God, the universe, and everything else. In his book, Hawking questioned the need of a creator and the efficacy of philosophy in the face of modern science. Hawking brought a radicalism to late twentieth century scientism by declaring God obsolete. Subsequently, Hawking received backlash from philosophers, critics, and creationists. Five years later in 1993, he published a retort in *Black Holes and Baby Universes* that claimed that philosophers were unable to keep up with advances in science and that his critics have only practiced refutation by denigration.

During the same period, Sagan continued to write books that pushed a scientific worldview and warn of global problems like nuclear weapons, global warming, and overpopulation. Many of Sagan's books sold a progressive history of science that insisted that science has supplanted religion as the best manner of knowing. By the time Sagan died in 1996, his legacy of popularization had already extended to other writers like Hawking who wrote

similar progressive histories of science within books that directly undermined religion and pushed a scientific worldview. Hawking wrote *God Created the Integers* and *On the Shoulders of Giants*—two books that created almost synthetic histories of science.

By the turn of the twenty-first century, other writers, like Brian Greene, Michio Kaku, and Richard Dawkins wrote their own books that say strikingly similar things. Dawkins and Greene directly stated that Sagan was a strong influence, while Sagan's influence pervaded Kaku's writing. Around 2004, New Atheism arose as a radical form of atheism aggressively opposed to religion and characterized by scientific and rational mores. Stenger's 2009 book *New Atheism* openly stated the New Atheist agenda. The agenda is essentially the agenda of scientism, key elements of which can be found in popular books written during the previous decades. New Atheism is the formalization of the scientism movement began by Sagan and Hawking, but with a different name. Their influence can be found throughout New Atheist texts. A centerpiece of the agenda—the anthropic principle—can also be found explained in multiple books.

Ultimately, the scientism movement is a product of early twentieth century advances in science, the secular humanist movement, World War II, and the atomic bomb. Scientific advancement in part drove the secular humanist movement—from Darwin to Hubble—advances in science undermined the mind-body duality and the place of God. Science also drove the Panzers, Mustangs, Spitfires, Zeroes, Shermans, and B-29s of World War II. After the war science garnered a certain measure of popularity as scientists came into conflict with policy makers. From the launch of Sputnik to the early 1970s, science in policy enjoyed a position in PSAC until President Nixon disbanded the committee. Differing images of science manifested in popular culture—modern and postmodern. As a modernist, Sagan was influenced by writers

like Asimov. He began to write books that advocate scientism. In turn, he influenced the President of the United States and subsequent generations of scientists. Hawking, who was acquainted with Sagan, joined the scientism scene in 1988. Since that time, he has acted as scientism's Jedi Knight, bringing a harsh radicalism of atheism and a denouncement of philosophy. By the turn of the twenty-first century, multiple authors advocated similar views and took part in a scientism movement known as New Atheism either directly, or on the periphery, utilizing books, articles, television shows, documentaries, and the World Science Festival.

Geopolitical Parlances

Examining the popular works of scientists enables an understanding of their worldview, and how they pushed that worldview through their popular works. It seems that world events most definitely influenced the scientist popularizers, but that they attempted to steer a steady course of scientism regardless of what occurred around them. During the Cold War, Sagan used historical happenstance to push his own brand of scientism and advocate a space-based scientific culture. The Cold War conditioned his actions, but even in the post-Cold War world his position remained the same. Only the rhetoric of his scientism changed to meet the concurrent world situation. Similarly, geopolitical circumstances, especially the rise of the information age and the end of the Cold War, conditioned Hawking's actions. Hawking used post-Cold War conditions to push his agenda of scientism, warning of things like the relaxation of east-west tensions and climate change as a rhetorical device to push his view of scientism throughout his popular works. The New Atheists used a similar strategy when they claimed that global terror, the religious right, the neoconservatives, and the Bush Administration suddenly caused them to

radically push an antireligious scientific worldview. In reality, this was already being done, most notably by Sagan and Hawking. It would seem that no matter what the geopolitical situation was, adherents to scientism found a way to use it to their advantage and push a scientific worldview through their popular works.

Global Conundrums

The popularizers presented three global conundrums through their popular works—nuclear weapons, global warming, and overpopulation. A quick historical trace uncovers the origins of each of these problems. Nuclear weapons arose at the end of World War II as a product of early twentieth century advancements in nuclear physics. Global warming emerged as a product of late eighteenth century industrialization that spread to the rest of the world by the twentieth century. This industrialization caused an increase in carbon dioxide and other greenhouse gases into the atmosphere, which in turn increased the average global temperature (despite the fact that conservative politicization of the issue says otherwise). Theoretical scientific advancements—such as increased knowledge of chemistry and electricity during the nineteenth century—catalyzed rapid and widespread industrialization. Ultimately, the agricultural revolution at the end of the last glacial maximum (furthest extent of glaciation during an ice age) spurred human population growth, but more recently rapid exponential population growth can be attributed to advanced agricultural practices, modern medicine, and the industrial revolution itself.

It is clear then that science caused these problems to occur. Throughout the popularizers' works they acknowledged these issues, but they did not acknowledge that an adherence to a

scientific worldview may be the root cause. In fact, they blamed bad governments for the misuse of science, and insisted that science itself holds the answers to these problems. It was a basic tenant of their scientism that science holds the answers to global conundrums, regardless of whether or not science, or an adherence to a scientific worldview, caused the problems in the first place. It is likely that they addressed these issues and suggested that science would find the answers because they knew that nuclear weapons, global warming, and overpopulation were the Achilles heel of their scientism. The issues had to be addressed in a manner that did not undermine the scientific worldview they advocated throughout their popular works. Therefore, they made it an integral part of their scientism that science would fix the problems.

White Indians

Around the turn of the twentieth century, anthropologists scoured South and Central America for white Indians—supposed remnants of lost Viking marauders.[295] A eugenics movement raged in America that insisted that those not biologically fit should be sterilized, and even euthanized. This application of Darwinist thinking culminated in the extermination of six million Jews and other undesirables at the hands of the Nazis during World War II. Adherents to scientism would have people believe that humanity has learned from its mistakes and should move forward unhindered with programs of genetic engineering.[296] Given humanity's track record of scientific misuse, this is doubtful. History has taught that extreme caution should be exercised when embracing scientific dogma and its real world applications.

[295] A good example of this can be found in: James Howe, *A People Who Would Not Kneel* (Washington, DC: Smithsonian Institute Press, 1998).
[296] This was discussed on May, 30 2014 during the World Science Festival in a segment entitled *Designer Genes: Fashioning our Biological Future*.

The University

Contrary to what the popularizers communicated, science may owe more to the medieval Christian university than to ancient Greece (churches are everywhere today, not shrines to Apollo). Ironically, the medieval Christian university began as a monochromatic monastic academy where only theology and the parsing of ancient philosophy that fit Christian dogma were taught. Over time, the monastic schools became more universal, especially during the high medieval period when they began to teach subjects such as medicine and law. The culture of the medieval Christian university—which is in many ways the predecessor of our own (to paraphrase Sagan's claim that the ancient Ionian culture is the predecessor of our own)—evolved into the scientific culture of seventeenth century Europe, where a clear program of mechanistic (scientism perhaps) thinking was underway. Irony also lies in the fact that by the mid twentieth and early twenty-first century, certain scientists advocated a return to the monochromatic academy, this time one dominated by science, not theology.

The Academy

> Then he who is to be a really good and noble guardian of the State will require to unite in himself philosophy and spirit and swiftness and strength?
>
> Undoubtedly.[297]

Scientism in the mid twentieth and early twenty-first century, as relayed by the popularizers of science, relays an important lesson. The popularizers acted in a political manner that sought to influence world leaders and cause a cultural shift towards science. They insisted

[297] Plato, *Republic*, 62.

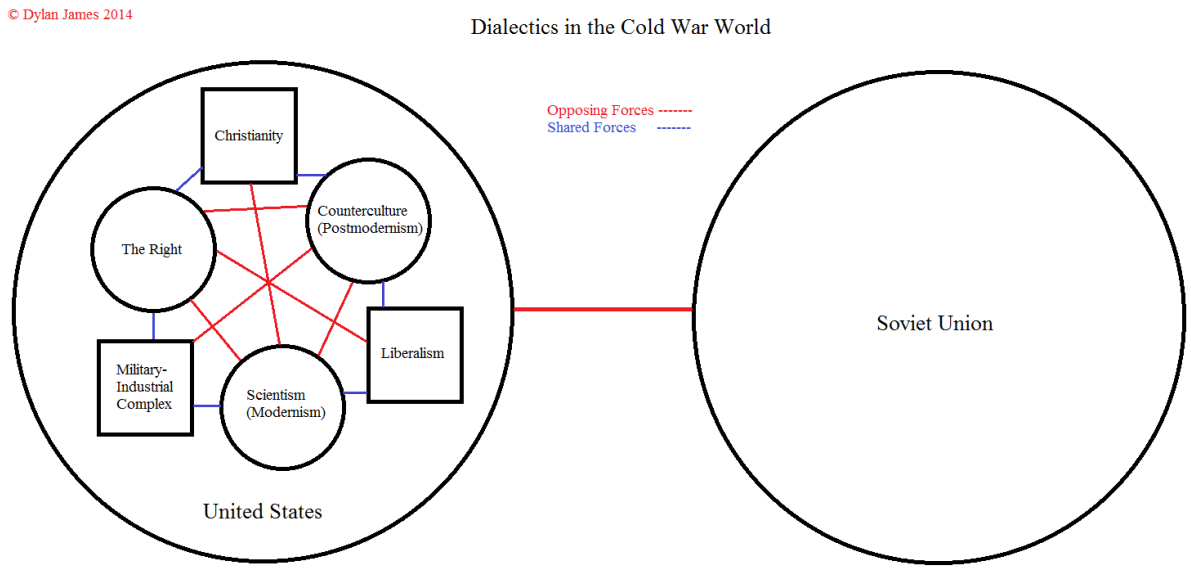
that they were the oracles and guardians of the state, and that the state, states, and the world should listen to their method alone. They suggested a monopoly of knowledge in which religion and philosophy had no place, and where only their academy reigned supreme.

To be fair, Sagan represented a well-rounded individual. In fact, he read Plato's *Republic*. Hawking, however, radicalized science's preeminent position over other ways of knowing, and the New Atheists took things aggressively further. The danger, in an information age world dominated by science, lies in the fact that one academy alone cannot be noble, philosophical, spirited, swift, and strong. Scientism's blind reliance upon technology and pure mathematics berates the selective advantage of the athlete. It demotes the nobility of the sage. And cuts short the spirit of the artist. Realistically, it empowers caustic, atheistic, capitalist enterprise while cutting short the imperfect garden of knowledge. The world does not need the academy; it needs the university.

Dialectics

The Soviet Union operated off of a philosophy of dialectical materialism espoused by Karl Marx and Freidrich Engels. This concept, also called historical materialism, states that all of human history progressed as a dialogue between the social classes over material resources. Sagan once commented upon the implications of not discovering extraterrestrial beings on Soviet thought (in *Intelligent Life in the Universe*)—could an absence of alien life undermine dialectical materialism? (Without aliens, there would be no cosmic dialectic between life-forms from different worlds. The interrelated whole of cosmic existence would be broken.)

Dialectics and shared forces riddled the landscape of twentieth and early twenty-first century scientism. The latter half of the twentieth century progressed as a dialectic between the United States and the Soviet Union—they caused one another to build up arms and achieve superpower status. The United States can be further broken down into quasi-political factions that vied for power within dialectical relationships that often overlapped with shared underlying entities. For instance, the faction of scientism—in many ways opposed to the Christian Right—shares an overlapping interest in the military-industrial complex with the conservative establishment. The interrelationships are very complex and the model presented here is an extreme simplification. A more detailed explanation of this phenomenon is illustrated below:



Public Opinion

There is a large demand for works of popular science. Many of the popularizers' books spent considerable amount of time on the New York Times best seller list, and many won awards. They sold millions of copies and elicited critical response.

Carl Sagan's *Cosmos* first entered the public arena as a television series in 1980. Soon after, the book version was released. According to a Stanford University press release from 1993, over 500 million people in 60 countries viewed the television series. The book was on the New York Times bestseller list for 70 weeks.[298] It sold 5 million copies internationally.[299] Sagan won the Pulitzer Prize in 1978 for *The Dragons of Eden*. *Pale Blue Dot* was on best seller lists throughout the world and the New York Times named it one of the notable books of 1995. The 1996 book *The Demon-Haunted World* became his eighth book on the New York Times best-seller list.[300]

An international demand existed for the popular works of Carl Sagan. He spread his message to 60 countries throughout the world, topped best-seller lists, and won awards. Millions of people read his books and watched his show. He became a popular, international icon of the scientific worldview. Furthermore, the fact that another scientist popularizer, Neil deGrasse Tyson and the FOX network rebooted the television series *Cosmos* in early 2014 reiterates Sagan's lasting popularity and the public's interest in works of popular science. Not all were

[298] Stanford University, "Carl Sagan to Lecture at Stanford April 23," *Stanford News Service*, April 12, 1993, accessed April 19, 2014, http://news.stanford.edu/pr/93/930412Arc3331.html.
[299] Louis A. Ruprecht, "Book Reviews," *Journal of the American Academy of Religion*, (1996) LXIV (2):459-464.
[300] David Brand, "Carl Sagan, Cornell astronomer, dies today (Dec. 20) in Seattle," *Cornell Chronicle*, December 19, 1996.

enthralled, however. Conservative Christians have criticized Tyson for not including ancient creation myths in the program.[301]

Stephen Hawking's #1 New York Times best-seller *A Brief History of Time* (1988) received similar acclaim. The book sold 10 million copies.[302] It was on the London *Sunday Times* best-seller list for more than four years and has been translated into 35 languages.[303] According to the Royal Society Website, Hawking's book *The Universe in a Nutshell* won the 2002 Aventis Prize for Science Books.[304] His 2010 work *The Grand Design* became the No.1 book on Amazon shortly after its release. It also caused many headlines and an uproar on the website Twitter due to the controversial assertion within the book that God does not exist.[305] Hawking's written works became so popular that they were modified into television shows. The Discovery Channel created two series based on Hawking's work—*Stephen Hawking's Grand Design* and *Into the Universe with Stephen Hawking*.

As with Sagan's popular works, a demand existed for the popular science of Hawking. Also similar to Sagan is the manner in which Hawking's popularity crossed national boundaries. His work was translated into many different languages and this allowed his message to reach a larger multinational audience. Hawking's physical image is highly recognizable. His facsimile has appeared in television shows such as *Star Trek: The Next Generation*, *The Simpsons*, and *Futurama*.

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[301] Amanda Marcot, "Cosmic meltdown! Neil deGrasse Tyson under siege from Christian right," *Salon*, April 4, 2014.
[302] Natalie Paris, "Hawking to experience zero gravity," *The Telegraph*, April 26, 2007.
[303] BBC, "Hawking's briefer history of time," *BBC*, October 15, 2001.
[304]The Royal Society, "Stephen Hawking, The Universe in a Nutshell, Winner, Aventis Prize for Science Books 2002," The Universe in a Nutshell, accessed 19 April 2014, https://royalsociety.org/awards/science-books/stephen-hawking/.
[305] Dwight Garner, "Many Kinds of Universe, and None Require God," *The New York Times*, September 7, 2010.

Brian Greene's *The Elegant Universe* became a bestseller that was turned into a NOVA miniseries in 2003.[306] *The Fabric of the Cosmos* made the New York Times best-seller list and was also adapted into a NOVA miniseries. His children's book, *Icarus at the Edge of Time*, was turned into a multimedia performance piece that played out in the United Palace Theater during the 2012 World Science Festival in New York.[307] Greene cofounded the World Science Festival as an additional venue to cause a cultural shift towards science.

Popularizers like Richard Dawkins and Michio Kaku garnered a certain level of popularity and critical response as well. Dawkins's 1976 *The Selfish Gene* gained international acclaim. According to the publisher—Oxford University Press—the book has sold a million copies and has been translated into 25 languages.[308] A critic claimed that Dawkins's New York Times best-seller *The God Delusion* "has succeeded in grabbing the public's attention in a way that other writers can only dream of."[309] Kaku's New York Times best-seller *Physics of the Impossible* attracted the attention of the Science Channel that turned his book into an original series.[310]

Numerous times the popularizers' books received so much attention that publishers translated them into other languages and networks created original series based on the books. This illustrates the initial popularity of the books and allowed the popularizers to reach an even larger, oftentimes international audience. In this manner the popularizers further propagated their cultural worldview, put increased political pressure on world governments to reform, and

[306] Dennis Overbye, "One Cosmic Question, Too Many Answers," *New York Times*, September 2, 2003.
[307] Michelle Michalos, "Icarus at the Edge of Time opens the 2012 World Science Festival," *Metrofocus*, May 21, 2012.
[308] Oxford University Press, "The Selfish Gene 30th Anniversary Edition," The Selfish Gene, accessed April, 19 2014, http://ukcatalogue.oup.com/product/9780199291151.do.
[309] H. Allen Orr, "A Mission to Convert," *The New York Review of Books*, January 11, 2007.
[310] Discovery Communications, "Science Channel Announces Multi-Year Agreement with Distinguished Physicist Dr. Michio Kaku," *Discovery News*, January 8, 2009.

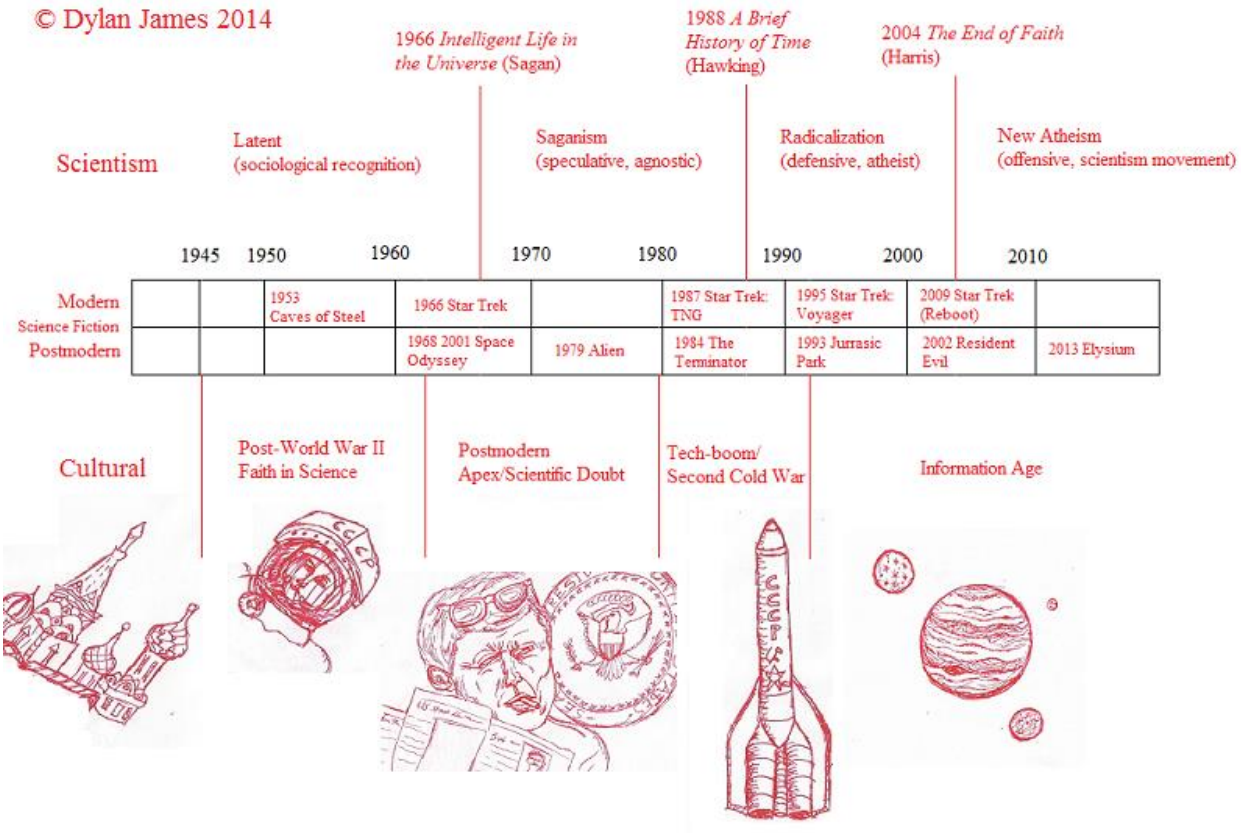
taught the public about science. The political side sought active concrete political posturing concerning global issues while the cultural side sought a more ethereal, abstract shift towards science with less corporeal results.

The Dragon's Last Words

A reading of Sagan's 1977 book *The Dragons of Eden* aids in understanding *Star Trek*, the reptilian brain, and the scientism movement's position. In the book, Sagan explained that the human brain is divided into neocortex, limbic system, and reptilian complex. In humans, the neocortex controls most of their waking lives and the r-complex is suppressed. Only when humans sleep does the r-complex reign supreme—a nightly respite of a predatory mammal's reptilian brain; a placation of Jurassic urges and Alice's errant daydreams.[311] *Star Trek* and the scientific worldview were a dream. With eyes wide open, the predator hunted it down, ironically to destroy the very r-complex that brought it about, and to usher in a new era of culturally dominated neocortical society. But can the scientists really operate without the T-Rex at their core?

[311] Carl Sagan, *The Dragons of Eden* (New York: Ballantine, 1977), 135-160.

Scientism Line



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Vita

Dylan James was born and raised in Tallahassee, Florida. His father is a geologist and his mother is a librarian. His brother studies political science and Italian at Florida State University. Dylan moved further north (although still South) for school and studied Spanish and art at Western Carolina University. Once in Boone for his master's degree in history, Dylan continued his daily activities of playing soccer, running, hiking, doodling, and going to the park with his dachshund, Cookie. In addition to studying the history of science, he particularly enjoyed studying Latin American history with Dr. Horst. Dylan plans on visiting the Shaolin Monastery upon graduation.