Nuclear Semiotics: Thomas Sebeok and the "Atomic Priesthood"

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Introduction

The most lasting legacy of the Cold War is not the warheads or the threat of a nuclear holocaust; it is more mundane yet no less threatening to human existence. This legacy is the problem of nuclear waste. With nuclear energy emerging as the main alternative to fossil fuels, and nuclear weapons being increasingly endorsed by authoritarian regimes and liberal democracies alike, megatons of waste is being produced in nuclear energy plants and weapons production facilities, adding to the huge amount of waste already accumulated since the beginning of the "atomic age" in the 1940s. Further, the unprecedented timescale of nuclear waste has presented a unique problem and threat to human civilization. The decay of radioactive elements is measured by its half-life -- the time it takes to lose half of its radioactivity.[1] A radioactive element is considered "gone" after ten half-lives. The primary fissile isotope used for the production of nuclear weapons and one of the three main isotopes demonstrated usable as fuel in thermal spectrum nuclear reactors, Plutonium-239, has a half-life of 24,100 years. This means that it requires 241,000 years to fully decay.[2] With nuclear waste, we are facing a problem of managing the most volatile substance on Earth, on an incredible time-scale. Storage of nuclear waste presents another serious problem as well: how do we protect nuclear burial sites from human interference, given the enormous time-scale? How do we warn future generations of the threat of nuclear waste and ensure the continuation of the human species? There is no way to accurately predict what human society will be like two hundred and forty thousand years from

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[1] "Backgrounder on Plutonium," United States Nuclear Regulatory Commission - Protecting People and the Environment, https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/plutonium.html (accessed June 10, 2017).
[2] Ibid.

now. These humans of the far future will likely be unable to understand any contemporary languages or symbols.

At the end of the Cold War, nuclear waste surfaced as a problem that called for specialists beyond physics, engineering, and nuclear energy safety; it called for humanities scholars as well as philosophers. One of these scholars was Thomas Sebeok, a professor of linguistics at the University of Indiana. Sebeok was one of the founders of the field of semiotics – the study of signs. It was this expertise that put Sebeok in the orbit of the U.S. Department of Energy's network of consultants on the problem of nuclear waste management. In 1980, the Human Interference Task Force (HITF) commissioned Sebeok's services as a consultant on the far-future implications of nuclear waste. The question Sebeok was asked to grapple with was: how can we make sure that the burial sites of nuclear waste will not be disturbed within the next ten thousand years? Sebeok proposed the creation of an "atomic priesthood" - a long-term, non-governmental, self-selecting body of experts, which would use artificially created religion and folklore to maintain a cultural memory of danger around the nuclear waste sites, thereby protecting them from human intrusion into the far future.

This futuristic project commissioned by the Department of Energy has not attracted much attention from historians thus far. Moreover, despite his role as one of the founders of semiotics in the 1970s, Sebeok is also largely overlooked in the history of Cold War science.[3] In my thesis I use the history of Sebeok's "atomic priesthood" proposal as an opportunity to revisit the historiography of science during the Cold War.

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[3] The only secondary source on Sebeok's proposal is an article published by a graduate student: Sebastian Musch, "The Atomic Priesthood And Nuclear Waste Management - Religion, Sci-Fi Literature And The End Of Our Civilization," *Zygon - Journal Of Religion And Science* 51, no. 3 (2016): 626-639.

Historians of Cold War science have traditionally focused on the rise of Big Science in the context of the nuclear arms race and the space race, and the rise of the military-industrial-scientific complex. "Big Science," a term coined by Alvin Weinberg in 1961, refers to the new form of scientific research during the Cold War – the large-scale national scientific endeavors carried out by large teams of scientists, using expensive instruments, and solving problems of nuclear weaponry, technology, and space travel.[4] These new, expansive and expensive forms of science, were funded by the government, and implied a symbiosis between academia, industry, and the military. This partnership was called the "military-industrial-scientific complex," and was frequently seen as a consequential development in post-WWII science.[5] These large-scale collaborations were also one of the sources of increased interdisciplinarity, and the rise of "open-mindedness" as a valued quality in Cold War America.[6] The discussion of the "nuclear age" often had explicit religious connotations. The relation between science and religion during the Cold War has been explored by the historians of science. The historian Paul Boyer, in particular, has pointed out that during the Cold War, science and religion became intertwined, with nuclear power assuming, in a certain sense, the role of religion. Nuclear weapons were identified as potential causes for a Biblical armageddon and presented as a sort of God-given power.[7]

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[4] Alvin Weinberg, "Impact of Large-Scale Science on the United States." *Science* 134, no. 3473 (1961): 161-164, on 161. http://www.jstor.org/stable/1708292.

[5] Audra Wolfe, *Competing with the Soviets: Science, Technology, and the State in Cold War America* (Johns Hopkins University Press, 2012).

[6] Jamie Cohen-Cole, *The Open Mind: Cold War Politics and the Sciences of Human Nature* (University of Chicago Press, 2014).

[7] Paul Boyer, *Fallout: A Historian Reflects on America's Half-Century Encounter with Nuclear Weapons*, (Columbus: Ohio State University Press, 1998).

The existing historiography of science during the Cold War helps us situate Sebeok and his proposal within the complex intellectual geography of Cold War science. A closer look at Sebeok and his "atomic priesthood" proposal, however, presents an opportunity to shed new light on some of the well-worn themes and to explore new themes in this historiography. Science fiction has emerged in recent years as an important site of historiographical inquiry and a site of innovation and scientific speculation during the Cold War and beyond.[8] The case of Thomas Sebeok presents a unique vantage point from which the spaces of ambiguity between the possible and the actual Cold War history can be fully explored; such investigation generates new themes which contributes to the rewrite of Cold War historiography.

Few archival sources on Sebeok's proposal are readily found. When I first began researching for this project, I had difficulty finding any traces of Sebeok's archive. An inquiry sent to Indiana University, where Sebeok worked for most of his career, helped to establish that Thomas Sebeok's personal papers were indeed held at the Indiana University archives, although they have been not processed. I was given access to the collection and made an archival trip there. This study uses Sebeok's papers not only for the actual information found there but also as a lead to other sources. Thus, correspondence between Thomas Sebeok and a choreographer named Liz Lerman in Sebeok's archive led me to tracking down the after-life of Sebeok's proposal in dance form. Chasing the paper trail of this project, I was able to gain an access to the files from Lerman's dance company kept at the archives at the University of Maryland. I also

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[8] See especially Joanna Radin, "Michael Crichton, Science Studies, and the Technothriller." Histories of the Future, http://histscifi.com/essays/radin/technothriller (accessed March 16, 2018).; Rebecca Lemov, ""Hypothetical Machines": The Science Fiction Dreams of Cold War Social Science." *Isis* 101, no. 2 (June 2010), 401-411. https://doi.org/10.1086/653107.

contacted a science-fiction writer, Arsen Darnay, whom Sebeok referenced and interviewed him by email.

The thesis is organized in six parts as follows:

1. The Many Worlds of Thomas Sebeok
2. The "Atomic Age"
3. "Nuclear Priesthood": the Ambivalence of the Phrase and the Power of Associations
4. The Issue of Nuclear Waste in Science Fiction
5. The Science Fiction World of NASA: The Far Future and Outer Space
6. The Reception of Sebeok's Proposals
7. The Afterlife of Sebeok's Proposal: Staging the "Atomic Priesthood" as a Dance

Part 1. The Many Worlds of Thomas Sebeok

Thomas Sebeok was born in Budapest, Hungary in 1920. He was the only child of a "lawyer-economist" father.[9] Sebeok's early life, as one of his colleagues noted in an obituary, was "decisively influenced by the second world war."[10] Reacting to wartime pressures, Sebeok left Hungary. He briefly attended Magdelene College in Cambridge, England, before joining his father in the United States the following year.[11] Sebeok's departure in 1937 is telling: Sebeok, fleeing Europe in 1937, was part of the refuge movement of prominent European intellectuals

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[9] Myrna Oliver, "Thomas Sebeok, 81; Linguist Debunked Theory About Apes." *LA Times*, January 7, 2002. http://articles.latimes.com/2002/jan/07/local/me-20890; There is little information about Sebeok's family background.

[10] Jesper Hoffmeyer, "Obituary: Thomas A. Sebeok." *Sign Systems Studies* 30, no. 1 (2002), 383-386, on 383. https://philpapers.org/rec/HOFOTA.

[11] Myrdene Anderson, "Thomas Albert Sebeok (1920–2001)." *American Anthropologist* 105, no. 1 (2003), 228-231. http://onlinelibrary.wiley.com/doi/10.1525/aa.2003.105.1.228/epdf.

who fled Europe in the wake of Hitler's rise.[12] He would learn after the war that "his whole family had been destroyed."[13] Having eventually settled in the U.S., Sebeok began to attend the University of Chicago, receiving a B.A. in anthropology.[14] He went on to earn a masters and doctorate in the field of linguistics from Princeton University, completing his PhD by 1945.[15] Sebeok's long association with Indiana University began in 1943, when he worked for the Army Specialized Training Program in foreign languages.[16] He taught "Eastern European and Asian languages and particularly Russian," and published his first book, *Spoken Hungarian* in 1944 as an outcome of this wartime project.[17] At Indiana University, Sebeok started Indiana University's Department of Uralic and Altaic Studies and served as a professor at IU for the rest of his career.[18]

At Indiana University, Sebeok taught anthropology and semiotics, as well as courses in Uralic and Altaic Studies.[19] He worked in diverse fields during his career: he pursued linguistic

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[12] Whether or not Sebeok was ethnically Jewish is unclear; I was unable to find anything about his family's ethnic background. Sebeok's archives are likewise silent about his family's and his own religious views. Although it is difficult to establish with certainly from the available sources, it seems that Sebeok was not particularly religious. He was sometimes alleged to be an atheist by the readers of his "atomic priesthood" proposals. These allegations may have been correct; I was not able to find a definitive answer regarding Sebeok's religious views or his family's religious background. In Sebeok's personal papers kept at Indiana University, there is only one file clearly related to religion, entitled "Hungarian Catholic League of America." This file holds a letter from the aforementioned League, addressed to Sebeok and asking for his financial support. Though Sebeok's secretary answered the letter in his absence, she wrote only that Sebeok would surely "feel honored" by the request. No answers from Sebeok exist in the file, from which it could be deduced that he did not subsequently establish any connection to the group. Nor do other documents that could give a hint on the matter exist in the archive.

[13] Jesper Hoffmeyer. "Obituary: Thomas A. Sebeok," 383.

[14] Myrdene Anderson. "Thomas Albert Sebeok (1920–2001)," 229.

[15] Jesper Hoffmeyer. "Obituary: Thomas A. Sebeok," 383.

[16] Jesper Hoffmeyer. "Obituary: Thomas A. Sebeok," 383.

[17] Myrna Oliver. "Thomas Sebeok, 81; Linguist Debunked Theory About Apes."

[18] Jesper Hoffmeyer. "Obituary: Thomas A. Sebeok," 383.

[19] "Press Release: Thomas A. Sebeok, Senior Fellow at SLIS, Passes On." School of Informatics, Computing, and Engineering; https://www.sice.indiana.edu/news/story.html?ils_id=364.

fieldwork around the world, traveling to Eastern Europe and the Soviet Union, Mongolia, Mexico, and across the United States.[20] Sebeok was also interested in folklore; he was an early member of the Folklore Institute at Indiana University and served as an editor of the *Journal of American Folklore* in the 1950s.[21] Sebeok's most important contributions, however, were in the field of semiotics. He was recognized as a distinguished figure in semiotics, and was elected as the editor-in-chief of *Semiotica*, serving in this capacity for the rest of his life.[22] He eventually moved into subfields of semiotics: zoosemiotics (the study of animal speech and sign usage) and biosemiotics (which interprets all of biology as a system of signs).[23]

Sebeok was a truly interdisciplinary scholar, and he liked to characterize himself as such, comparing himself to an academic "*Apis mellifera,* who darts 'solitary from flower to flower, sipping nectar, gathering pollen from flowers, serendipitously fertilizing whatever he touches.'" Sebeok's work with the Human Interference Task Force is a perfect example of his interdisciplinarity. The Human Interference Task Force was an interdisciplinary body convened by the U.S. Department of Energy in 1980, with the stated goal of determining "whether reasonable means exist (or could be developed) to reduce the likelihood of future humans unintentionally intruding on radioactive waste isolation systems" over a timescale of ten thousand years.[24] The Task Force itself consisted of six specialists in management and science. It

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[20] Soren Brier. "Thomas Sebeok: Mister (bio)semiotics An obituary for Thomas A. Sebeok by Søren Brier." *Cybernetics and Human Knowing* 10, no. 1 (2003), 102-105, on 103. https://www.academia.edu/17041377/Thomas_Sebeok_Mister_Bio_semiotics_An_obituary_for_Thomas_A._Sebeok.

[21] John Mcdowell. "Thomas A. Sebeok (1920-2001)." *Journal of American Folklore* 116 (Fall 2003), 483-484, on 483. https://muse.jhu.edu/article/48630/pdf.

[22] Soren Brier. "Thomas Sebeok: Mister (bio)semiotics," 102.

[23] Ibid., 102.

[24] Berry, Warren, Ekman, Paul, Givens, David, Kaplan, Maureen, Kukla, George, Sebeok, Thomas, and Tannenbaum, Percy, et al., "Reducing The Likelihood Of Future Human Activities That Could Affect

was headed by a specialist in nuclear waste management, William M. Hewitt. The other members included several members from the Bechtel Group: Janet Owen, a specialist in environmental science, Linda Ulland, a political scientist, and Neil Norman, an engineer.[25] The main Task Force itself, then, already qualified as an interdisciplinary body. The Task Force was further assisted by several consultants, who specialized in various other useful fields of science or communication. These consultants included David B. Givens, an anthropologist, Maureen Kaplan, an archaeologist, Warren Berry, a specialist in materials science, and five others. Sebeok's involvement with the Task Force began when he was invited as one of these consultants.

The work of the Task Force was summarized in the report for the Office of Nuclear Waste Isolation, submitted in May of 1984.[26] Each of the eight consultants to the HITF contributed to the report, recommending measures for preventing human interference into waste sites. Entitled "Reducing the Likelihood of Future Human Activities That Could Affect Geologic High-Level Waste Repositories," the report concluded that it was indeed possible to significantly reduce the likelihood of human interference into nuclear waste sites in the 10,000-year range and presented recommendations on how to do so. The report operated under several assumptions. First, the HITF assumed that the chosen site would not "require long-term maintenance or surveillance."[27] In other words, any strategies for preventing human interference would be

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Geologic High-Level Waste Repositories" (Columbus, OH: Office of Nuclear Waste Isolation, 1984), iii/iv.
The timeframe of 10,000 years, though not sufficient to ensure the decay of all significant kinds of nuclear waste, was chosen to be "consistent with the U.S. Department of Energy's Statement of Position on the NRC Waste Confidence Rulemaking."

[25] Ibid., 121

[26] Ibid.

[27] "Reducing The Likelihood Of Future Human Activities That Could Affect Geologic High-Level Waste Repositories," 8.

unmanned. Second, because nuclear waste was to be contained using deep geologic disposal, the report focused on scenarios in which future societies had "a general level of societal knowledge and technology sufficient to disrupt a mined geologic repository."[28] If the society was unable to physically access the nuclear waste, the report argued, no messages were needed to keep them out (i.e. natural disasters were deemed an unlikely danger by the HITF). Third, the task force was considering a time span of up to ten thousand years. The report acknowledged that some kinds of nuclear waste would remain dangerous past this time span but the number was chosen as a reasonable estimate for most radioisotopes excepting plutonium.[29] With these three assumptions in mind, the Task Force recommended the use of multiple redundant messages of varying complexities. Messages included symbols conveying the dangers of nuclear waste, written warnings in several languages, and so forth.[30] These messages were to be durable, detectable, and convincing.

Sebeok and his fellow consultants had not only to come up with practical measures, but also to make their fields of expertise accessible to the members of the Task Force. To this end, Sebeok wrote a report, entitled "Communication Measures to Bridge Ten Millennia." Sebeok first publicly presented these ideas as part of the 1981 Alfred Korzybski Memorial Lecture at the Yale Club. This lecture constituted the earliest version of Sebeok's proposal available to the public (though he had already submitted a report to the Human Interference Task Force). This report was relatively short at twenty-eight pages. Most of the report was dedicated to explaining basic semiotic principles: different types of messages, channels of communication, and basic

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[28] Ibid., 10.
[29] Ibid., 11.
[30] Ibid., 43-52.

problems encountered in semiotics. Sebeok describes the obvious problems with certain ways to preserving a message, such as using contemporary languages or symbols. He makes several general recommendations: the use of symbolic languages (such as mathematical equations) to communicate, the creation of many redundant messages in case some are lost, and the creation of a relay system of messages (under which each message would be created only to last three hundred years, after which it would be rewritten).

Sebeok's most controversial proposal, however, was for the creation of an "atomic priesthood." As Sebeok explained in this lecture, he used the term "priesthood" only for "dramatic emphasis."[31] He went on to define the priesthood as a "self-selective" group of "knowledgeable physicists, experts in radiation sickness, anthropologists, linguists, psychologists, semioticians, etc." That is to say, it was fundamentally a secular body rather than a religious organization.[32] Sebeok intended for this "priesthood" to use religion as a tool. He proposed that the atomic priesthood would use a "legend-and-ritual" to create "accumulated superstition to shun [a nuclear waste site] permanently."[33] He further said that the priesthood should encourage the re-encoding of warning messages, "with perhaps the veiled threat that to ignore the mandate would be tantamount to inviting some sort of supernatural retribution."[34]

While Sebeok envisioned his priesthood as a secular group of experts who would use religion as a tool to protect waste sites, he was ambiguous regarding the specific meaning of his term. Although the priesthood was presented in explicit terms as a secular body, certain parts of

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[31] Thomas Sebeok, "Pandora's Box: Why and How to Communicate 10,000 Years into the Future." Lecture, 1981 Alfred Korzybski Memorial Lecture, Yale Club, New York City, NY, November 6, 1981, 37.
[32] Ibid., 37.
[33] Ibid., 37.
[34] Ibid., 41.

Sebeok's lecture implied a strong religious connotation. Moreover, Sebeok's own explanations of his "atomic priesthood" proposal would change over time. In later presentations, he would frequently de-emphasize the use of artificial religion and folklore. Thus, in a letter to HITF colleague David Givens, Sebeok expressed disappointment about critiques of his priesthood as sacrilegious and stated that much of the problem could have been avoided by simply naming the group the "Atomic 'Commission.'"[35] In his letter to a critic who had learnt of Sebeok's idea through newspaper articles, Sebeok wrote: "the folkloristic devices briefly mentioned should be 'supplementary' to a host of other techniques."[36] Closer to the end of his long career, in 1997, when seventy-seven year old Sebeok was interviewed for a documentary, he regretted using the word "priesthood," saying it was a "mistake" and that "all [he] meant was a committee."[37] Sebeok, however, was not the first to use the term, and he was a latecomer in the debates about nuclear waste and, more generally, the larger implications of nuclear energy.

Part 2: The "Atomic Age"

In August 1945, United States bombers dropped two atomic bombs on Japan, ending World War II and opening what was soon dubbed "the Atomic Age." Nuclear technology was frightening and controversial from the very beginning. Research on the possibilities of nuclear power, including its military application, began soon after the discovery of nuclear fission in 1938. The beginning of World War II and especially the Japanese attack on Pearl Harbor

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[35] David B. Givens to Thomas A. Sebeok. May 3, 1985, Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[36] Thomas A. Sebeok to David R. Howell. February 7, 1985, Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[37] "Countdown to Eternity". Film directed by Reinhard Schneider. 1997.

prompted the US to begin an all-out crash program to develop nuclear weapon. This expensive nationwide project was called the Manhattan Project.[38] Due to a lack of scientific knowledge, the urgency of the project, and general carelessness, many workers in the Manhattan Project were exposed to dangerous levels of radiation. Huge amounts of radioactive waste was dumped into the environment. [39] Operating under the theory that "radiation exposures below permissible doses were acceptably safe," Manhattan Project administrators were content to simply dilute low-level waste and release it into the environment.[40] For example, at the Hanford plutonium production plant, one of the sites of the Manhattan Project put into operation in the early 1940s, low-level nuclear waste was simply mixed with water and poured "into depressions in the ground, creating open swamps and ditches of radioactive mud."[41] Arguing that winning the war was the most important goal, the Manhattan Project scientists and administrators often covered up the dangers of nuclear radiation. Some of these dangers were not widely known. During the first years of the Manhattan Project, the public was mostly unaware of the existence of nuclear weapons or the dangers of radiation, and public concern was minimal.

Knowledge of the atomic bomb became public in 1945, after the bombing of Hiroshima and Nagasaki. The following year, the U.S. government established the Atomic Energy Commission (AEC) – a civilian agency mandated to manage all aspects of nuclear technology, including assessing the dangers of nuclear waste, planning its long-term storage, and addressing

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[38] Audra J. Wolfe, *Competing with the Soviets: Science, Technology, and the State in Cold War America* (Baltimore: The Johns Hopkins University Press, 2013), 10.

[39] Early nuclear scientists drew a sharp distinction between "high-level" nuclear waste (generally waste products from nuclear reactors) and "low-level" waste (all other waste). High-level waste was considered extremely dangerous, while low-level waste was considered safe in small quantities.

[40] J. S. Walker, *The Road to Yucca Mountain: The Development of Radioactive Waste Policy in the United States* (Berkeley: University of California Press, 2009), 6.

[41] Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (Oxford: Oxford University Press, 2013), 61.

public concerns. The AEC continued many of the Manhattan Project's practices regarding radioactive waste. Although WWII had officially ended, the news that the USSR and Stalin had nuclear weapons of their own was used to justify the continuation of wartime policies during the precariously peaceful conditions of the Cold War.[42] In many documented cases, the AEC mismanaged nuclear waste and exposure to nuclear radiation.[43] As a general policy, AEC officials prioritized efficient production of nuclear weapons over the protection and safety of their employees and the environment from the dangers of radiation.[44]

The dangers of radioactivity emerged as an issue in the minds of average Americans almost a full decade after the beginning of the "Atomic Age" in 1945. Several reports by various non-governmental scientific organizations in the mid-1950s indicated to the public that even low levels of exposure to radiation could cause adverse genetic mutations.[45] These findings, however, were outweighed by the official AEC's theory of "permissible doses" of radiation: that small doses of radiation from low-level waste presented no significant dangers. The issue of the radioactive health hazards was most forcefully brought to the public eye in the wake of the Castle Bravo test of the first thermonuclear device in 1954. The test was a disaster. An unexpectedly large explosion and shifting winds exposed the Marshall island natives, as well as American sailors and researchers, to heavy doses of radiation. Most disastrously, the explosion also exposed Japanese fishermen on a nearby boat to significant amounts of radiation. Nearly all of these fishermen suffered symptoms of radioactive sickness. One died six months later and was found to have the radioactive isotope strontium-90 in his bones. Through resulting Congressional

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[42] Wolfe, *Competing with the Soviets,* 17.
[43] Walker, *The Road to Yucca Mountain.*
[44] Ibid., 7.
[45] Wolfe, *Competing with the Soviets,* 108.

investigations, the public learned that levels of radioisotope Strontium-90 found in soil in the US were also higher than normal. The message was that no one was safe no matter how far away test explosions were held. Despite the AEC repeatedly assuring the public that low levels of exposure to nuclear radiation were harmless, civilians became increasingly aware of the dangers of nuclear radiation.[46]

The beginning of the anti-nuclear movement in the US can be effectively traced back to the Castle Bravo test controversy. In 1957, Linus Pauling, Caltech professor and Nobel Prize winner in chemistry, became the public face of the anti-nuclear movement, starting a petition calling for an end to nuclear testing. He quickly gathered thousands of signatures from scientists. Soon afterwards, civilian groups such as the Committee for Nuclear Information (CNI) broke the AEC monopoly on nuclear research, further demonstrating the health risks of exposure to even low levels of nuclear radiation.[47] Civilian efforts culminated in the Limited Test Ban Treaty, signed by the U.S., Soviet Union, and more than a hundred other countries in 1963, which banned nuclear weapon tests in outer space.

American universities were associated with nuclear technology from the very beginning. During the Manhattan Project, scientists at the University of Chicago, the University of California, Columbia University, and others were responsible much of the testing and research for nuclear weapons.[48] Later, universities became a part of "Big Science," performing many of the research duties for governmental applications of nuclear technology. In the late 1960s, these universities joined the protest against nuclear technology. In particular, these students and

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[46] Ibid., 107.
[47] Wolfe, *Competing with the Soviets*, 108-110.
[48] Ibid., 11

professors were concerned that their scientific work was being used for morally-objectionable goals. The Vietnam War highlighted these concerns, with the use of chemical weapons such as Agent Orange.[49] Concerns over the morality of researching Agent Orange raised questions about nuclear weapons: should researching nuclear weapons also be considered immoral? These concerns appeared most dramatically during the March 4th movement, planned at MIT in the year 1969. On March 4th, students and faculty at MIT would halt all research, and instead spend the day discussing the relationship between science and military. More than thirty other universities, such as the University of Chicago and Stanford University, joined the movement.[50] These movements raised concerns with student involvement in the nuclear industry as well. With the increasing awareness regarding the negative effects of nuclear reactors and weapons, researchers could no longer consider themselves morally neutral. Many began to reconsider the morality of creating more nuclear weapons and reactors, and the effects of their research.[51]

In 1973, an influential *Los Angeles Times* article revealed long-standing mismanagements of nuclear waste at the Hanford site by the AEC.[52] The following year, an AEC attempt to store waste in a salt mine in Kansas fell apart when the site was discovered to be unsafe at the last minute, leading to outrage and political fallout.[53] Due to these disasters and accumulated negative public opinion, the AEC was abolished in 1974, and replaced with the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC).[54] In

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[49] Kelly Moore, *Disrupting Science: Social Movements, American Scientists, and the Politics of the Military, 1945-1975* (New Jersey: Princeton University Press, 2013), 134.
[50] Ibid., 137-145.
[51] Ibid., 132.
[52] Wolfe, *Competing with the Soviets*, 90.
[53] Ibid., 72.
[54] Ibid., 93.

1977, the Department of Energy (DOE) was created, taking over the functions of the ERDA. On future nuclear projects, the DOE would work together with the NRC.

The dissolution of the AEC could not stop public unease regarding management of nuclear technology and waste. In 1979, widespread panic was again created by the Three Mile Island accident, during which the partial meltdown of a nuclear reactor irradiated the surrounding area.[55] Responding to the Three Mile Island disaster and growing public concerns, the DOE worked with the Battelle Memorial Institute between 1979 and 1981 to identify sites which could permanently store high-level nuclear waste, containing it for at least ten thousand years.[56] During this process, Yucca Mountain was identified as one of the potential sites. It was out of this project that the Human Interference Task Force was born: after the DOE found sites capable of physically storing waste for ten thousand years, the HITF was called upon to determine whether the sites could be kept safe from human intrusion over the same timescale.

Part 3. "Nuclear Priesthood": the Ambivalence of the Phrase and the Power of Associations

The phrases "atomic priesthood" and "nuclear priesthood" are suggestive, and invite many different connotations and meanings. The terms were used both figuratively and literally. In the figurative usage, the power and control of the nuclear industry was compared to that of a religious elite. The term "priesthood" was thus invoked to critique and problematize the concentration of power and the lack of accountability of these experts. In the literal sense of the phrase, the word "priesthood" was used to refer to a pseudo-religious body associated with some

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[55] Walker, *The Road to Yucca Mountain*, 124-125.
[56] Ibid., 171-172.

elements of the nuclear industry. In what follows I will trace the usages of these terms before Sebeok own usage.

In his book *Nuclear Power Rebellion*, published 1972, Richard S. Lewis presents "atomic priesthood" as a term already in currency.[57] Lewis was the editor of the *Bulletin of Atomic Scientists*, and the author of several popular science books on Cold War topics, including the history of NASA projects. As Lewis explains, the phrase "atomic priesthood," which was in use since the early 1960s, was a metaphor designating an intellectual elite, not a literal religious body. In Lewis's words, "when the Limited Test Ban Treaty was debated in the United States Senate in 1963, some scientists expressed regret that the mysteries of the nuclear age were so arcane that only an intellectual elite, *an atomic priesthood*, was capable of understanding and passing judgment on questions of nuclear policy."[58]

It was Alvin Weinberg, however, who popularized the term. Weinberg was an influential nuclear physicist, working first at the Manhattan Project, and later making important contributions to the technology of nuclear reactors.[59] Due to his involvement with nuclear technology from its very beginning, Weinberg was keenly aware of the problems presented by nuclear waste, and advocated the need for a long-term management plan. In his 1972 article, "Social Institutions and Nuclear Energy," Weinberg wrote about the problems caused by the long lifespan of nuclear waste. He argued that the use of nuclear energy constituted a kind of "Faustian bargain" -- society would receive "an inexhaustible source of energy," but in return

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[57] Richard S. Lewis, *The Nuclear-Power Rebellion; Citizens Vs. the Atomic Industrial Establishment* (New York: Viking Press, 1972).
[58] Ibid., 9. Emphasis added.
[59] "Alvin M. Weinberg," Atomic Heritage Foundation, https://www.atomicheritage.org/profile/alvin-m-weinberg (accessed Jan. 6 2018).

would have to contain dangerous radioactive waste for tens of thousands of years.[60] Weinberg described the "military priesthood which guards over inadvertent use of nuclear weapons," and recommended the creation of a similar "priesthood," a "permanent social order," to watch over nuclear reactors and waste.[61] This group was never intended to be religious; Weinberg simply proposed a long-lasting, autonomous group in control of nuclear reactors and waste sites.

Weinberg's term was quickly taken up by journalists. In newspaper articles, the term "nuclear priesthood" appeared more often than "atomic priesthood," and usually deployed to criticize government policies. A 1978 newspaper article quoted a politician criticizing an opponent as "a true believer, a member of the original nuclear priesthood."[62] In this case, the politician used the term "nuclear priesthood" to criticize his opponent for his blind faith and belief in nuclear technology, comparing it to religious devotion. A 1982 article, "Questioning the Nuclear Priesthood," focused on the nuclear freeze movement and the challenge it supposedly posed to the American "nuclear priesthood."[63] The article went on to criticize the "priesthood" for building "more numerous, more powerful, more accurate weapons," calling this decision "unnecessary and dangerous."[64] Another 1982 article entitled "George Weil and the Birth of the Bomb" did not directly mention a priesthood, but was littered with religious terms. George Weil, as the article described him, was a nuclear physicist who had become disillusioned with the nuclear industry as a whole. He was a "nuclear apostate, an infidel" who had grown "wary of the

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[60] Alvin M. Weinberg, "Social Institutions and Nuclear Energy." *Science* 177, no. 4043 (1972), 27-34, on 33. http://www.jstor.org/stable/1733911.
[61] Ibid., 34.
[62] David Burnham, "Atomic Energy's Allies and Foes Assail U.S. Nuclear Commission," *New York Times*, Jul 09, 1978.
[63] Townsend Hoopes, "Questioning the Nuclear Priesthood." *The Washington Post*, Apr. 18, 1982.
[64] Ibid.

nuclear god's promise."[65] The article describes nuclear technology as a Faustian bargain, emphasizing the sacrifices already made and the risks for the future generations to come: the deaths at Hiroshima and Nagasaki, the Three Mile Island accident, the health hazards resulting from exposure to radiation.

For many Sebeok's contemporaries, however, the association of nuclear power with religion had more literal than figurative connotations. Almost immediately after atomic bombs were dropped on Hiroshima and Nagasaki, Americans began to view the Biblical apocalypse in explicitly nuclear terms. Fred Kirby's hit 1945 song "Atomic Power," for example, referred to nuclear weapons as "given by the mighty hand of God."[66] Kirby's song further alludes to the Bible, comparing nuclear weaponry to God's "brimstone fire" and describing "two great cities ... scorched from the face of earth," a line which refers both to Hiroshima and Nagasaki, and to the Biblical cities of Sodom and Gomorrah.[67] Numerous Bible quotes were argued to refer directly to nuclear weapons. For example, Peter 3:10, which reads "The Heavens shall pass away with a great noise, and the elements shall melt with fervent heat, the earth also and the works that are therein shall be burned up" was widely cited as foretelling nuclear apocalypse.[68] The language in the Bible was reinterpreted, aligning the reading of the Bible with the nuclear age. Hal Lindsey Jr., in his *The Late Great Planet Earth*, argued that the "falling stars and stinging locusts of Revelation [referred to] warheads fired from space platforms and Cobra helicopters spraying

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[65] Paul Hendrickson, "George Weil and the BIRTH of the BOMB: 'What We Need Is a New Idea,' Says a Man Grown Wary of the Nuclear God's Promise," The Washington Post, August 1982, https://search.proquest.com/news/docview/147424762/8AC1F310498942DBPQ/.

[66] Paul Boyer, *Fallout*, 131.

[67] "Atomic Power by The Buchanan Brothers [1946]," Atomicplatters.com, http://atomicplatters.com/more.php?id=33_0_1_0_M (accessed Jan. 6 2018).

[68] Paul Boyer, *When Time Shall Be No More: Prophecy Belief in Modern American Culture*. (Cambridge: Harvard University Press, 2009), 116.

nerve gas," for example.[69] These connections continued into and were still present in the 1980s, when Sebeok was writing. In 1984 -- the very year in which Sebeok's report was released to the public-- S. Maxwell Coder published a book explaining how the Bible predicted nuclear technology.[70]

Sebeok was well aware of these different meanings and connotations of the phrase he adopted. However, along with the writings of fellow scientist Alvin Weinberg, the journalistic renderings of the phrase, and the dramatic apocalyptic scenarios, there was another medium in which the phrase was circulated. This medium was science fiction. Science fiction was used in the 1960 and 1970s as a radical medium for the discussion of various emerging issues of the time, ranging from the notion of biological risk to the new field of science studies.[71] Science fiction was often inspired by real-life scientific scenarios and written in a way that was open-ended, exploratory and fiercely imaginative. It was this medium with such characteristics that provided Sebeok with his main source of inspiration.

Part 4. The Issue of Nuclear Waste in Science Fiction

Well before Sebeok's proposal to use religious tools to preserve knowledge and memory of the nuclear waste sites, the notion of "atomic priesthoods" – religious organizations which worshipped nuclear technology – was well explored in science fiction. The 1970 film, *Beneath the Planet of the Apes*, for instance, depicted a post-apocalypse in which a group of surviving

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[69] Paul Boyer, *Fallout.* 139.
[70] Ibid., 143.
[71] As the historian Joanna Radin has argued, science-fiction writers such as Michael Crichton had extensive scientific knowledge and wrote sci-fi novels blending fantasy and fact, see Joanna Radin, "Michael Crichton, Science Studies, and the Technothriller," http://histscifi.com/essays/radin/technothriller.

humans worshipped an ancient and undetonated nuclear bomb.[72] One prominent early example of the exploration of this theme appeared in the 1951 short story collection, *Foundation*, written by Isaac Asimov.[73] Asimov was one of the most popular and influential science fiction authors in the United States. He was also a scientist: Asimov held a PhD in chemistry from Columbia and worked as a biochemistry professor at Boston University.[74] Asimov was also a popularizer of science, both in his scientifically-accurate works of fiction, and in books he wrote explaining scientific topics to layman readers.[75] Asimov was a figure much like Sebeok: crossing the boundaries between the scientific, technical and imaginative in his career trajectory.

In a short story collection published in 1951, Asimov described a religion of science – in this case, a pseudo-religious group which used advanced science and technology to perform "miracles" and convert less scientifically-advanced peoples. For example, Asimov's "priests" cured believers of cancer by administering "Holy Food" (actually a kind of radiation therapy).[76] The character, Salvor Hardin, commented that the scientific religion was created "because the barbarians looked upon our science as a sort of magical sorcery, and it was easiest to get them to accept it on [a scientific] basis."[77] In other words, Hardin argued that pseudo-religion could be used to conceal or transmit scientific messages: a similar argument to Sebeok's own.

Another writer who explored this theme was a well-known American science fiction author Walter M. Miller. In his 1959 novel, *A Canticle for Leibowitz*, Miller described a

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[72] *Beneath the Planet of the Apes*. Directed by Ted Post. (United States: Twentieth Century-Fox Film Corp., 1970).
[73] "Isaac Asimov," Biography.com, Accessed Jan. 6, 2018, https://www.biography.com/people/isaac-asimov-9190737.
[74] Erik Gregersen, "Isaac Asimov | Biography & Facts," Encyclopedia Britannica, last modified March 15, 2018, https://www.britannica.com/biography/Isaac-Asimov (accessed Mar. 6, 2018).
[75] Ibid.
[76] Isaac Asimov, *Foundation* (London: Harper Voyager, 1951), Part 3, Chapter 1.
[77] Ibid., Part 3, Chapter 1.

post-apocalyptic world in which most scientific knowledge has been lost. The monastery of Leibowitz, however, is dedicated to copying and preserving scientific documents, though even the monks no longer understand their significance. In the novel, Leibowitz, knowing that scientific knowledge would soon be lost, intentionally connected science with religion by reframing scientific documents as religious artifacts to be copied.[78] After his death, a religious group venerating him continued to preserve scientific documents. Leibowitz's fictional work, then, directly mirrors Sebeok's suggestion to spread knowledge of the dangers of nuclear waste through religion and folklore.

An even more powerful example of this connection, however, appeared in the writings of Arsen Darnay, whose work Sebeok directly cited. Sebeok, introducing the atomic priesthood in his report, wrote that such an idea had "also been suggested by Darnay."[79] Arsen Darnay, like Sebeok, was born in Hungary and moved to the United States in 1956.[80] In the U.S., he began to publish works of science fiction in magazines such as *Galaxy Science Fiction* and *Analog Science Fiction*. In August 1976, he published the novella "Aspic's Mystery" in the *Analog Science Fiction* magazine. Two years later, Darnay published a full-length novel, *Karma,* set in the same universe as "Aspic's Mystery." These works did not receive large amounts of popular or critical attention. Darnay and Sebeok did not know each other personally;[81] nevertheless, Sebeok discovered Darnay's works, and alluded to "Aspic's Mystery" and *Karma* in his HITF report.[82]

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[78] Walter M. Miller, *A Canticle for Leibowitz*. (London: Gollancz, 1959).
[79] Sebeok, *I think I Am A Verb*, 168.
[80] Arsen Darnay, personal communication with the author, February 19, 2018.
[81] Ibid.
[82] Ibid.

These two stories introduce the character Teddy Aspic, who proposed in the 20th century the creation of an atomic priesthood to watch over nuclear waste. This organization, as Aspic described it, would be explicitly religious; the "priests" were to be compelled by religion to protect nuclear waste sites. The U.S. government accepts the proposal, and the atomic priesthood survived for thousands of years, watching over plutonium. "Aspic's Mystery" is set entirely in this distant future, while *Karma* takes place partially in the 20th century and partially in the far future.

Darnay's vision of the atomic priesthood was detailed in "Aspic's Mystery." In this story, an aging atomic priest discovered old documents. These documents were faded and nearly illegible, but they conveyed the original purpose of the priesthood. They described the basic problem of nuclear waste: "plutonium 239 … fantastically long half-life … will have to be contained for at least 250,000 years."[83] The documents went on to suggest a sort of religion to watch over nuclear waste, in much the same way as Sebeok. The writer "seriously [proposed] that society create a new kind of 'priesthood' to watch over the waste, much as medieval monks watched over mankind's written history."[84] As justification, the writer argues that religious bodies seemed to be "somehow insulated from the rise and fall of nations through the centuries."[85] This proposal shared several clear similarities with Sebeok's own.

Darnay's atomic priesthood, while similar to Sebeok's, differed in one respect. The Plutonium Priests in the far future of "Aspic's Mystery" thought of nuclear waste and radiation as a deity. Scientific knowledge about nuclear waste had been lost over time, and the priests

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[83] Arsen Darnay, "Aspic's Mystery." *Analog Science Fiction*, September 1976, on 84.
[84] Ibid., 84.
[85] Ibid., 84.

began to worship nuclear waste, instead of fearing and isolating it. The narrator and his fellow monks refer to nuclear waste as "Godbod," and view the degenerative effects of radiation as a divine blessing.[86] Indeed, the narrator is overjoyed when a sore caused by exposure to radiation appears above his eye, writing that "Godbod has heard me at last."[87] The narrator also writes that only the abbot was allowed to access the room called "Power," which held a "dense mass of Godbod more powerful in its emanations than anything in our caverns," and that this "explained why abbots had so brief a life. Godbod's love called them to an early bliss."[88] Although the priests in Darnay's story retain knowledge of the harmful effects of radiation, they have reframed these effects as a sort of blessing. Despite this change in attitude, the priests still served their original purpose, gathering radioactive substances and bringing them back to the monastery for storage. This detail could be seen as a criticism of Sebeok's proposal: over the eons, there would certainly be a chance that the initial purpose of any atomic priesthood would be forgotten.

Sebeok's proposal and Darnay's writings shared a major similarity: both held assumptions about the power and persistence of religion. "Aspic's Mystery" contained a letter sent to a government official, arguing for an atomic priesthood by saying that "real permanence cannot be achieved without a little mumbo-jumbo. We cannot rely on good will and a sense of duty alone … a kind of compulsion is necessary."[89] The character Teddy Aspic, when first pitching an atomic priesthood to a government organization, argued that:

> the most enduring human institutions are religious. They have staying power. They outlive national organizations - or at least they have always done so in the past. Can you guarantee that there'll always be a United States? I don't want to suggest that anything

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[86] Ibid., 79.
[87] Ibid., 92.
[88] Ibid., 88.
[89] Darnay, "Aspic's Mystery," 86.

> drastic will happen, but face it - 250,000 years is one hell of a long time … Future generations need to be protected.[90]

Sebeok, similarly, theorized about the power and persistence of myth, giving as an example the myth of Pandora's Box, which survives today more than 2500 years after its inception. Use of religion also constitutes a major difference between Sebeok and Darnay, however. Sebeok wanted to use myth and religion to compel outsiders to stay away from nuclear waste sites, while the "atomic priests" would be entrusted with the actual truth. In Darnay's story, however, religion was used to compel the atomic priests themselves to protect the site.

Similar arguments for the power and persistence of religion appeared in other science fiction works as well. In Isaac Asimov's *Foundation*, religion was singled out as a tool because "the barbarians looked upon science as a sort of magical sorcery, and it was easiest to get them to accept it on that basis."[91] Here, Asimov presented an argument that religion is easier to understand and accept by uncivilized people and can be used as a tool of control better than science can. Similarly, Sebeok argued in his "Communication Measures to Bridge Ten Millennia" that a primary difficulty in warning future humans of the dangers of nuclear waste was that "there [was] no assurance that future generations would obey the injunctions of the past."[92] In Miller's *A Canticle for Leibowitz*, the character Isaac Leibowitz created a religion with the goal of preserving scientific documents in a post-apocalyptic world: another argument for the persistence of religion over that of science. In Miller's novel, scientific documents only survived because they were repeatedly copied by the monks of the Order of Leibowitz, who treated them

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[90] Arsen Darnay, *Karma* (London: Sphere, 1978), 13.
[91] Asimov, *Foundation*. Part 3, Chapter 1.
[92] Sebeok, "Communication Measures to Bridge Ten Millennia," 27.

as a sort of holy document. This argument for the power of religion again mirrors the one found in Sebeok's report.

Both Sebeok and Darnay also described the priesthood as a mechanism for keeping a secret. Sebeok wrote that the scientific truth about what was stored at nuclear sites would be "entrusted exclusively" to members of the atomic priesthood.[93] Darnay, similarly, suggested that only the highest-level priests would be given all information. The narrator of "Aspic's Mystery" described portions of "the Mystery" to which "only the highest ranking monks" would have access.[94] The narrator complained bitterly about a "revisionist" group of monks who [wanted] to shield themselves from radiation instead of exposing themselves to it. Various other suggestions which appeared in Sebeok's report may have been influenced by science fiction as well. Sebeok suggested re-encoding the message periodically:

> What is being proposed here is a so-called "relay system" of information transmission, which rests on a very simple scheme: to divide the 10,000-year epoch into manageable segments … Assuming that 10,000 years is equivalent to ~300 generations of humankind, it is recommended that the messages at the burial sites be designed for only three generations ahead.[95]

Sebeok also suggested a kind of re-encoding for the legends created by the atomic priesthood, writing that legends should be "retold year-by-year (with, presumably, slight variations)."[96] A similar mention of re-encoding also appears in "Aspic's Mystery," and may have influenced Sebeok. The narrator, living in the far future, finds documents from the 1970s about the atomic priesthood, and decided to "quote the most pertinent portions of the Golden Age documentation" and supplement it with "[his] own narrow observations about the daily life of an aging archivist,"

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[93] Ibid., 24.
[94] Darnay, "Aspic's Mystery," 88.
[95] Sebeok, "Communication Measures to Bridge Ten Millennia," 26.
[96] Ibid., 24.

in hopes that his writing would one day be discovered by a "pious and energetic monk of the future," who could discover the truth.[97] *A Canticle for Leibowitz* also contains a similar suggestion of re-encoding: the Order of Leibowitz is dedicated to re-encoding scientific documents through illuminated manuscripts and other copies. While the scientific value of these documents had long since been forgotten in the post-apocalyptic world of *A Canticle for Leibowitz*, illuminated copies still held value, and therefore were more likely to be preserved.[98] In a sense, then, the monks were re-encoding the scientific documents into a more powerful form for their own time.

It is clear, in conclusion, that various elements of popular culture and science fiction influenced Sebeok's idea of the atomic priesthood. Generally speaking, this idea was popular in science fiction. Asimov's *Foundation*, Walter M. Miller's *A Canticle for Leibowitz*, and the science fiction writings of Arsen Darnay share very clear similarities with Sebeok's proposal. Almost every element of Sebeok's proposal, from the underlying assumption about the longevity of religion, to the radical idea of training a pseudo-religious group to watch over nuclear waste, was earlier explored in science fiction. Taking this idea from the medium of science fiction, however, Sebeok made it palatable outside of science fiction, in the "real world" of governmental agencies and policy think tanks.

The Human Interference Task Force project was not the only government-connected project of its time engaged with science-fiction-esque problems of communicating into the far future. The U.S. space agency, NASA, was likewise concerned with the problem of far future. The Space Age, much like the Atomic Age, posed the question of communication with distant

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[97] Darnay, "Aspic's Mystery," 78.
[98] Miller, *A Canticle for Leibowitz*, 82-83.

beings. While NASA pursued communications with extraterrestrials instead of humans of the far future, the question was much the same: how to communicate with faraway and temporally distant beings on an unprecedented time-scale?

Part 5. The Science Fiction World of NASA: The Far Future and Outer Space

In the 1970s, NASA sent up several satellites and probes which carried messages to unknown beings in outer space in far future. Based on the semiotic and linguistic profiles shared by the message sent by NASA and HITF, I believe that HITF was partially inspired by these widely-publicized NASA projects. Sebeok himself was certainly aware of these projects. In his report, "Communication Measures to Bridge Ten Millennia," Sebeok briefly mentioned *Voyager* and *Pioneer*, arguing that their messages were unlikely to be understandable by extraterrestrials. [99] There was evidence that the public connected these projects as well. In 1981, a professor, Thomas Tanner, wrote to Sebeok asking about his work with the Human Interference Task Force. Tanner inquired "whether [Sebeok was] consulted on the symbols placed on the deep space probe … in case it should make contact with beings which might be able to 'read' it."[100] Importantly, Tanner made the implicit connection between Sebeok's expertise in semiotics and the two projects dealing with communication with faraway beings who would be unlikely to share our language or culture.

Voyager is most known NASA's venture into far-future communication, but it was not the first of its kind, nor the last. Before *Voyager* NASA launched *Pioneer*, and after *Voyager* it

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[99] Sebeok, "Communication Measures to Bridge Ten Millennia," 18.
[100] Thomas Tanner to Thomas A. Sebeok. December 8, 1981. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.

sent LAGEOS. The *Pioneer* probes were launched first out of the three: *Pioneer 10* was launched in 1972, and *Pioneer 11* followed shortly after in 1973.[101] These unmanned probes were primarily used to study the outer solar system (taking pictures of Jupiter, for example). Their momentum would carry them, however, out of the solar system, and the two probes were used to carry messages to any extraterrestrial beings that may encounter them. LAGEOS was a satellite launched in 1976; unlike the *Pioneer* probes it was not expected to ever leave the solar system. However, it was expected to orbit the Earth for 8 million years, and a message was included for the benefit of any far-future humans who may encounter it. The *Voyager* probes were launched in 1977, and, like *Pioneer 10* and *11*, left the solar system. These probes carried a more complex message than either *Pioneer* or LAGEOS, again addressed to extraterrestrials.

The person behind the conception of the messages carried by *Pioneer*, LAGEOS, and *Voyager* was Carl Sagan. Carl Sagan was an astronomer and a celebrity scientist.[102] He was born in 1934 in Brooklyn, New York. As a child, he "read science fiction avidly," and became interested in astronomy.[103] Sagan attended the University of Chicago, where he earned a PhD in astronomy and astrophysics in 1960.[104] He went on to become a professor at Cornell. He was an accomplished scientist who published many articles in astrophysics. Sagan is best remembered, however, as a popularizer of science. He hosted the "Cosmos" television series, which explained scientific topics to mass audiences. He also wrote several popular science books, including

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[101] "The Pioneer Missions," NASA, last modified March 3, 2015, https://www.nasa.gov/centers/ames/missions/archive/pioneer.html (accessed Feb. 20 2018).
[102] William Dicke, "Carl Sagan, an Astronomer Who Excelled at Popularizing Science, Is Dead at 62," *New York Times*, December 21, 1996, https://archive.nytimes.com/www.nytimes.com/learning/general/onthisday/bday/1109.html.
[103] Ibid.
[104] Ibid.

Cosmos and *The Cosmic Connection: An Extraterrestrial Perspective*.[105] Sagan even forayed into the field of science fiction, and his novel *Contact* was published in 1984.[106] Sagan, much like Isaac Asimov, was an accomplished scientist as well as a science popularizer. While Asimov was content to write science fiction, however, Sagan brought science fiction ideas into the real world with his NASA projects.

The two *Pioneer* probes each carried a golden plaque, intended to "communicate the locale, epoch, and something of the nature of the builders of the spacecraft."[107] The message inscribed on the plaque had two main elements. First, there were scientific symbols intended to explain the position of Earth within the solar system. Second, there were line drawings of a man and a woman, meant to inform extraterrestrials about the makers of the probes. In his book, *The Cosmic Connection*, Carl Sagan described some of the considerations in the design of these drawings. The man and woman were "not shown holding hands lest the extraterrestrial recipients believe that the couple is one organism joined at the fingertips."[108] They were shown in different positions (the man with one hand raised, the woman with one leg angled outwards) "so that the suppleness of the limbs could be communicated."[109] Sagan also acknowledged some of the potential failures of the plaque, writing that "the conventions of perspective and line drawing popular on Earth may not be readily apparent" to extraterrestrials.[110]

The *Voyager* probes were sent several years after the *Pioneer* missions, in 1977, and carried "a more ambitious message … a kind of time capsule, intended to communicate a story

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[105] Ibid.
[106] Ibid.
[107] Carl Sagan, *The Cosmic Connection: An Extraterrestrial Perspective* (New York, N.Y.: Anchor Books, 1980), 22.
[108] Sagan, *The Cosmic Connection*, 25.
[109] Ibid., 25.
[110] Ibid., 26.

of our world to extraterrestrials."[111] This message was stored on a phonograph record, and contained spoken greetings to extraterrestrials in 55 languages, samples of music from around the world, images (depicting both scientific concepts and aspects of life on earth), and sounds of animals, nature, and human life.[112] For the *Voyager* project, Sagan headed a committee that chose the contents of the record.

LAGEOS held a plaque addressed to future humans. As Sagan explained in his book, *Murmurs of Earth*: "The estimated lifetime of LAGEOS before it burns up in the Earth's atmosphere is eight million years. This is sufficiently far in our future that a great deal of information may be lost between now and then - including information on the epoch and purpose of LAGEOS itself."[113] The message was very simple: intended simply to explain to future humans the purpose behind LAGEOS, and the year in which it was launched (as indicated by the positions of the continents). The LAGEOS satellite constitutes a closer connection to the HITF project than *Voyager* or *Pioneer*: it, too, was a message intended for humans of the far future.

The HITF and NASA projects shared many common features. Both were government-funded attempts to communicate with faraway beings who would likely have no knowledge of modern language or culture. In the words of the HITF report, one of the primary problems in communicating with human beings ten thousand years into the future would be comprehensibility: they could not "predict what cultures or societies [would] exist several hundred or several thousand years from now, the level of knowledge or technology those

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[111] "The Golden Record," Voyager, https://voyager.jpl.nasa.gov/golden-record/ (accessed March 16, 2018).
[112] Ibid.
[113] Carl Sagan, *Murmurs of Earth: the Voyager interstellar record* (Burbank, CA: Warner New Media, 1992), 9.

societies may possess, or the specific codes that they [would] use."[114] In other words, messages on nuclear waste sites had to be intelligible to human beings in the far future, about which little could be predicted; they could be completely different culturally or even evolutionarily, and would almost certainly speak a very different language. The *Voyager* and *Pioneer* probes grappled with a similar -- even more difficult - problem: communicating with extraterrestrial lifeforms.

The NASA probes and the nuclear waste protection programs each grappled with the problem of the distant future. Both projects faced incredible timescales by conventional human standards: the HITF message needed to survive for ten thousand years, while the *Voyager* and *Pioneer* probes were intended to last for hundreds of millions of years.[115] For various reasons, each project also struggled with creating a succinct enough message to be passed safely into the far future. As the HITF report explained, the primary (first level) message should be very simple in order to be easily conveyed and remembered: simply a warning to stay away. For NASA's projects, the message was constrained to what could be easily carried by a small space probe. The *Pioneer* probes and LAGEOS carried small plaques, while the *Voyager* probes carried a record. In both cases, however, the amount of information transmitted was severely constrained.

Both Sebeok's proposal and the NASA projects were criticized as reductionist and simplistic. Sebeok's atomic priesthood was criticized for obscuring scientific knowledge with religion. As Sebeok clarified in a letter, however, the religious mandate to stay out would constitute only one of five message levels. The highest level message would contain "detailed

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[114] "Reducing The Likelihood Of Future Human Activities That Could Affect Geologic High-Level Waste Repositories," 37.
[115] Sagan, *The Cosmic Connection*, 22.

technical information" about the nuclear waste site.[116] The critics of the *Pioneer* plaque similarly complained about various omissions, such as an explanation of human reproduction, to which Sagan sarcastically replied that "there was not quite room for this on a 6-inch by 9-inch plaque."[117] Even the *Voyager* Golden Record, which could hold much more information, received similar complaints. The Record could not contain a greeting in every language, nor could it contain all important pieces of music from all cultures.[118] There were concerns that certain cultures would be underrepresented. Both projects, then, faced similar constraints, and encountered similar criticisms as a result.

The NASA projects shared a common concern with the Human Interference Task Force and Sebeok: sending a comprehensible message. Both projects attempted to use artificial mathematic and scientific languages to ensure comprehensibility. In the case of NASA's projects, Sagan argued that any extraterrestrials capable of retrieving the probes would be scientifically advanced, and therefore attempted to write the messages "in the only language we share with the recipients: Science."[119] Sagan argued that science was a kind of universal language and would be comprehensible to any sufficiently-advanced civilization, and dismissed any concerns regarding cultural relativism. The LAGEOS and *Pioneer* plaques each use technical symbols instead of modern languages, in an attempt to remain comprehensible. Sagan's argument was clearly mirrored by Sebeok's recommendations in *Communication Measures to Bridge Ten Millennia*. Sebeok argued that one "layer" of the message should consist of:

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[116] Thomas A. Sebeok to David R. Howell. February 7, 1985, Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[117] Sagan, *The Cosmic Connection*, 27.
[118] Sagan, *Murmurs of Earth*.
[119] Sagan, *The Cosmic Connection*, 22.

> communication in artificial languages, which are mainly of two kinds, general purpose languages, and languages restricted to the communication of some specified subject matter. The use of mathematical formulae is an old and conspicuous special purpose language, and may safely be assumed to embody the physical laws of the universe, understandable throughout the cosmos.[120]

Here, Sebeok was arguing for the use of mathematical formulae at nuclear waste sites for the benefit of future humans. An example of a useful formula could be a mathematical formula describing the radioactive decay of waste, and the time it would take to fully decay. Both projects recommended the use of mathematics and science, as a kind of universal truth which should be understandable to any sufficiently-knowledgeable culture or civilization.

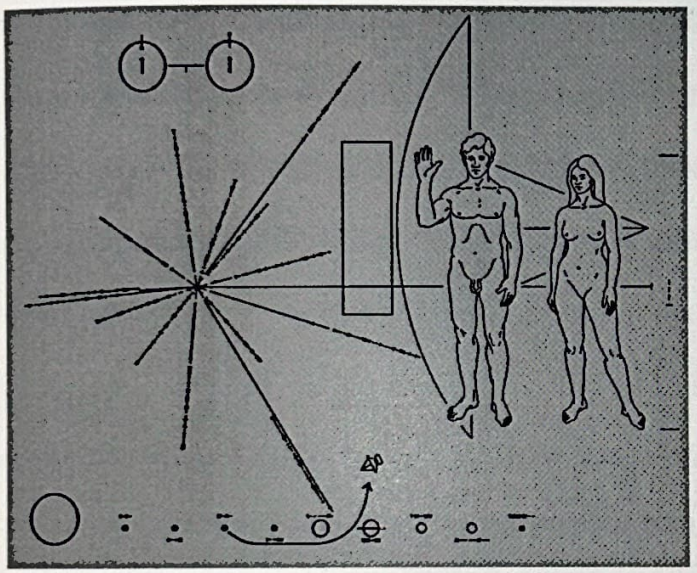

Fig. 1: The *Pioneer* plaque

Each of these messages aimed to benefit distant beings with no relation to the senders. There are no clear selfish considerations in the messages sent by the HITF or Sebeok, or in the messages carried by *Voyager*, *Pioneer*, or LAGEOS. Defending human beings of the far future

[120] Sebeok, "Communication Measures to Bridge Ten Millennia," 25.

held no obvious benefit that would make it worth spending money on. At best, long-term nuclear waste messages could be thought of as protecting the human race. The messages sent to potential extraterrestrials were even further removed from any sort of personal benefit. Sagan acknowledged that "the nearest civilizations [contacted with the *Voyager* or *Pioneer* probes] might be as far as a thousand light-years away" -- any group contacted would likely never come to Earth at all.[121] If extraterrestrials contacted by the probes did come to Earth, there would be no guarantee that they would be friendly, and if they were hostile, the message could provide helpful information to alien aggressors. One critic of the *Pioneer* plaque even argued that "the man on the plaque is portrayed as making [something similar to a Nazi salute]" and that "the extraterrestrials [might] deduce that the wrong side won World War II and promptly mount a punitive expedition to Earth to set matters straight."[122] And either way, the aliens who found the *Voyager* or *Pioneer* probes would exist in the far future, and could exert no influence on the senders of the probes.

Part 6. The Reception of Sebeok's Proposals

Sebeok's proposals received mixed responses. Soon after the publication of "Communication Measures to Bridge Ten Millennia" in 1984, journalists picked the story up, presenting it as an example of government folly and nuclear excess. Prominent American newspapers such as the *Washington Post*, the *New York Times,* and the *Los Angeles Times* published articles about his ideas, as did less well-known newspapers and magazines. The newspapers reported that a mysterious group called the Human Interference Task Force had, with full approval of the

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[121] Sagan, *Murmurs of Earth*, 47.
[122] Sagan, *The Cosmic Connection*, 29.

government, made several outlandish recommendations for protecting nuclear waste sites into the far future.[123] Sebeok's recommendations for the creation of an "atomic priesthood" were widely criticized as sacreligious, as a symbol of the overgrowth of the nuclear industry, or as an unrealistic and poorly thought out idea.

These responses indicated several facets of public reaction to Sebeok's idea. Most obviously, the abundance of articles indicated that the idea was indeed interesting to the American public. Newspapers and the public seemed to be interested in several main aspects of Sebeok's idea, and advertised articles about Sebeok using these ideas. First, they were interested in the connection between religion and nuclear technology. This focus can be seen in the titles of some of the articles. For example, a 1984 *Los Angeles Times* article was titled "'Priests' May Preach Nuclear Waste Myths," demonstrating interest in the connection between religion and nuclear waste.[124] Similarly, a *Washington Post* article from the same year was titled "A Nuclear Ritual for the Ages."[125] A focus on religion also appeared in the articles themselves. William McPherson's article for the *Washington Post*, "Futurespeak," was infused throughout with religious language: he referred to various scientists as "contemporary shamans," and called Indiana University "one of semiotics' major temples."[126] The *Los Angeles Times* article, "'Priests' May Preach Nuclear Waste Myths," similarly emphasized Sebeok's religious recommendations: after briefly mentioning some of the HITF's suggestions, the article concluded with a series of quotes from Sebeok's report about the creation of an atomic

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[123] T. R. Reid, "Warning Earthlings of Atomic Dumps," *The Washington Post*, 11 Nov. 1984.; William, McPherson, "Futurespeak," *The Washington Post*, 13 Nov. 1984.
[124] "'Priests' May Preach Nuclear Waste Myths," *Los Angeles Times*, 12 Nov. 1984.
[125] T. R. Reid, "A Nuclear Ritual for the Ages," *The Washington Post*, 26 Nov. 1984.
[126] McPherson, "Futurespeak."

priesthood.[127] A *Wall Street Journal* article, "U.S. May Concoct Tales of Horror To Deter Trespass at Nuclear Site," described Sebeok's usage of "'curse of the Pharaoh' type myths" to "literally keep people scared away," again emphasizing religious themes.[128]

Perhaps an even more prevalent theme of interest was the proposed timescale of 10,000 years. Many articles emphasized the enormity of a project intended to last for ten thousand years. For example, a *Washington Post* article from 1984 was entitled "Futurespeak."[129] This article further emphasized the incredible timescale of the project, sarcastically stating that the end-date of the project is "a mere three or four hundred generations away."[130] A *New York Times* article from the same year was titled "On Warning Posterity About a Nuclear Tomb," similarly placing the incredible timescale at the forefront.[131]

The final major focus of articles about Sebeok's report was several of Sebeok's other recommendations, outside of the atomic priesthood. For example, the article "'Priests' May Preach Nuclear Waste Myths," listed "several possible [other] ways [proposed by Sebeok] to make sure dumps are avoided in the future": "cartoon warnings that show a figure drinking water from a well and then dying while his friends flee," "making the dumps so 'repulsively malodorous' that people are driven away," "creating a modern 'Stonehenge' to ring the dumps," and "genetically encoding a warning in human genes."[132] These ideas, especially the one involving genetic encoding, seemed clearly taken from science fiction. Other articles such as "A Nuclear Ritual for the Ages" described the same four suggestions in very similar wording,

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[127] "'Priests' May Preach Nuclear Waste Myths." *Los Angeles Times*.
[128] Con Psarras, "U.S. May Concoct Tales of Horror to Deter Trespass at Nuclear Site," *Wall Street Journal*, 25 Jun. 1984.
[129] William McPherson, "Futurespeak."
[130] Ibid.
[131] Judith Miller, "On Warning Posterity about a Nuclear Tomb," *New York Times*, 25 Nov. 1982.
[132] "'Priests' May Preach Nuclear Waste Myths." *Los Angeles Times*

perhaps drawing from the same summary of Sebeok's report.[133] In the case of these ideas, however, newspapers clearly misrepresented Sebeok. These ideas played no significant role in Sebeok's report. Three of the ideas were mentioned by Sebeok only in passing. The suggestions of making the waste "repulsively malodorous" and of using cartoons were used by Sebeok only as brief examples; he did not actually suggest their use. In his discussion of channels of communication and the importance of redundancy, Sebeok wrote that "for instance, if the site can be rendered repulsively malodorous for a lengthy period, that would be, at least provisionally, a deterrent against casual exploration."[134] Sebeok clearly was not actually recommending this measure, and he provided no explanations for how this bad smell would be implemented. He simply used it as an example. Indeed, Sebeok actually mocked the idea of using a stench to keep out intruders, arguing that it would be impossible to produce a stench potent enough to last 10,000 years.[135] Similarly, Sebeok briefly mentioned cartoons in the fourth section of his report, "Some Problems of Imaging."[136] Again, cartoons were brought up solely to illustrate certain semiotic principles; Sebeok never actually recommended their use. Genetic encoding of warning signs appeared only in a brief part of the introduction, in which Sebeok mused over potential ways in which future humans would be able to transmit messages:

> It should be noted, in passing, that an era will come when messages vitally important to the race, affecting its survival, will be transmissible by micro-surgical intervention with the human molecular blueprint, but the technology required for this form of temporal communication is far from available as yet. Therefore, in what follows, this theoretical possibility will not be further considered.[137]

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[133] T.R. Reid, "A Nuclear Ritual for the Ages."
[134] Sebeok, "Communication Measures to Bridge Ten Millennia," 19.
[135] *Countdown to Eternity*. Directed by Reinhard Schneider.
[136] Sebeok, "Communication Measures to Bridge Ten Millennia," 17.
[137] Ibid., 2.

Again, it is abundantly clear that Sebeok did not intend to actually propose the use of genetic encoding. The fourth idea, that of creating a "modern 'Stonehenge'," did not appear anywhere in any version of Sebeok's report.[138] It was, however, discussed at length in the Human Interference Task Force's report, and perhaps newspapers confused the two.[139]

Further, the "atomic priesthood" suggestion was in reality only a small part of Sebeok's report. Yet, newspapers focused on the atomic priesthood, mostly ignoring Sebeok's other recommendations. For example, a primary part of Sebeok's proposal was to re-encode the message periodically to ensure comprehensibility. Specifically, he wanted the message to be designed to last for only three generations, after which it would be re-encoded. Through this kind of relay system, Sebeok thought, the message could remain comprehensible for all ten thousand years.[140] This major suggestion was mostly omitted from newspaper articles. Similarly, Sebeok heavily emphasized the importance of redundancy, writing that "when the channel [of communication] is noisy … so that some messages are received erroneously, containing certain distortions … the introduction of redundancy will make it much more probable that some or all of the errors may be corrected."[141] The recommendation of message redundancy was again left out of a majority of newspaper articles about Sebeok's report. The omission of these key ideas was another way in which newspapers clearly misrepresented Sebeok's actual suggestions.

Most articles about Sebeok's work held at least a vaguely critical tone. An article for *Wall Street Journal* poked fun at Sebeok's idea, comparing the atomic priesthood to something

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[138] "'Priests' May Preach Nuclear Waste Myths." *Los Angeles Times*.
[139] "Reducing The Likelihood Of Future Human Activities That Could Affect Geologic High-Level Waste Repositories," 65-77.
[140] Sebeok, "Communication Measures to Bridge Ten Millennia," 26.
[141] Sebeok, "Communication Measures to Bridge Ten Millennia," 25.

seen in an *Indiana Jones* film, and ending with the line "How about 'Indiana Jones and the Department of Energy'?"[142] Several published letters to the editor of *The Washington Post*, collectively entitled "Messages for the Millennia," offered direct criticisms of the atomic priesthood. Peter Kranz compared Sebeok's ideas to the jokes of a "starving standup comic."[143] Vaughn P. M. Keith criticized what he called the "myopia of the Department of Energy and the faithless naivete of Prof. Sebeok" regarding the persistence of language.[144] Keith argued that Latin had been comprehensible for 2,500 years, and that English was a perfectly good language to preserve a message for 10,000 years. A *Time Magazine* article, "Warning Signals: Symbols for 10,000 Years," was similarly critical, ending with a quote from a "congressional staffer": "They're really going to have to come up with something better."[145]

The most clearly critical article was published in *Anthropology Newsletter* by Clayton C. Denman in February 1985. Echoing other critics, Denman expressed concerns that Sebeok's protection plan for nuclear sites was intended to encourage the creation of more nuclear waste. He wrote that, for Sebeok, "nuclear waste dumps become feasible" because of the atomic priesthood.[146] Like many other critics of Sebeok, Denman seemed to be concerned about the increasing power of the nuclear industry, and saw Sebeok's ideas as contributing to this. But Denman's main criticism was concerned with the potential effects of an atomic priesthood on science. He asked readers to

consider the ramifications of this perversion of science. Will libraries of the future be purged of the "truth" while the real discoveries of science are secreted in computers to which only

[142] Con Psarras, "U.S. May Concoct Tales of Horror to Deter Trespass at Nuclear Site," *The Wall Street Journal*, 25 Jun. 1984.
[143] Peter M. Kranz, "Messages for the millennia," *The Washington Post*, 23 Nov. 1984.
[144] Ibid.
[145] "Warning Signals: Symbols for 10,000 Years." *Time Magazine*, 25 Nov. 1984.
[146] Clayton C. Denman. "Creation Anthropology." *Anthropology Newsletter*, February 1985. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.

> the priesthood of professionals and the genetically unaltered have access? … Below Dr. Sebeok's apparent scientific elitism I see an underlying contempt for science and the integrity of the scientific community.[147]

In other words, Denman was concerned that Sebeok's suggestion of deception when it comes to protecting nuclear waste would begin a deceptive trend in science.

A book published in 1995 provided another very clear critique of Sebeok. Written by John J. Kohut, this book was entitled *Stupid Government Tricks: Outrageous (but True!) Stories of Bureaucratic Bungling and Washington Waste*. The back cover summarized the contents, stating:

> It's hard to believe that anyone could do this -- but somehow our government manages very nicely, thank you. Pols, bureaucrats, and assorted (so-called) public servants have devised the most outlandish, outrageous, and implausible way of mindlessly throwing away money. Now this hilarious exposé reveals more than three hundred unbelievable but true occurrences of [U.S. government mistakes].[148]

The back cover listed some of the included government projects, including "A 14-page instruction book on how to purchase a fruitcake … A $45,000 dog-house."[149] Sebeok's idea was included in Kohut's book in the section "Bad Ideas." Kohut wrote that Sebeok "suggested back in 1984 the development of 'curse of the Pharaoh' type of myths to scare people from [nuclear waste sites]" and that Sebeok was "inspired by watching old 'monster movies'."[150] Kohut's decision to include Sebeok's work in a book called *Stupid Government Tricks* indicated that he considered the atomic priesthood an unrealistic waste of time and tax money.

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[147] Ibid.
[148] John J. Kohut *Stupid government tricks: outrageous (but true) stories of bureaucratic bungling and Washington waste* (New York: Plume, 1995).
[149] Ibid.
[150] Ibid., 91.

The response was not limited to media outrage. Some of the newspaper stories' readers wrote personal letters to Sebeok. These letters shared some common features. First, a significant number of these letters were sent by well-educated experts, who considered the possibilities of incorporating Sebeok's ideas into their own work. For example, J. Renn Olenn, who worked in the "field of public safety" sent a letter to Sebeok discussing his use of warning signs.[151] In another example, Wayne Ashley, who taught a course at NYU "on theories of performance" wrote to Sebeok expressing his interest in the use of "performative solutions" to protect nuclear waste.[152] Government figures also wrote to Sebeok: Paul Staes, a "member of the European Parliament," showed interest in Sebeok's report.[153] Second, unlike newspaper articles, most of these letters were not particularly critical. Generally, the letters were simply brief requests for a copy of Sebeok's report. It seems that, for the most part, only those who appreciated Sebeok's ideas to some extent took the trouble to contact him.

However, there were a few exceptions; several letters to Sebeok directly criticized his ideas, or attempted to open a dialogue. Bruce Luthanen, a chemist, severely criticized the idea of an atomic priesthood. Luthanen wrote that the idea of an atomic priesthood was a "genuine horror" to him, and criticized the idea for three main reasons.[154] First, Luthanen wrote that Sebeok's proposal added "fuel to a public already ablaze with a knee-jerk hysteria towards the nuclear industry."[155] In other words, Luthanen was concerned that Sebeok's association between

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[151] J. Renn Olenn to Thomas A. Sebeok. November 21, 1984. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[152] Ashley, Wayne to Thomas A. Sebeok. Jan. 17 1985. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[153] Paul Staes to Thomas A. Sebeok. November 30, 1984. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[154] Bruce A. Luthanen to Thomas A. Sebeok. November 12, 1984. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[155] Ibid.

religion and nuclear waste would enhance public fears about the power of the nuclear industry. Second, Luthanen repeatedly characterized the idea of an atomic priesthood as a regression. He wrote that the idea was "nothing less than a re-institution of Druidic ritual" and constituted a "reversion to our primitive roots."[156] Third, Luthanen criticized Sebeok's perceived disrespect for religion. He wrote that

> there are a wide variety of professional folk who have relegated the Bible to nothing more than an elegant storybook - I hope that you are not numbered among these. In the scientific community, there are still enough events unexplainable, mysteries yet unsolved, and frontiers untouched to allow the existence of a real and living God in this world. If we pull any item forward from antiquity, this should be it. Man is not yet so sophisticated that he can scoff at things not understood.[157]

Luthanen clearly saw Sebeok's willingness to use an artificial religion as a tool as disrespectful towards Christianity and other religions, and implied that Sebeok himself might be anti-religious.

Another letter attempting to open a conversation was sent to Sebeok by William B. Edwards in November 1984. This letter was not as overtly critical as that of Luthanen. Edwards brought up other possible solutions to the problem Sebeok is trying to solve, for example launching nuclear waste into space with rockets.[158] Edwards' letter betrayed several major misunderstandings of Sebeok's idea; he seemed to believe that religion would be used to compel atomic priests to protect nuclear sites, and that such priests would be responsible for protecting active nuclear reactors as well as waste. He wrote that "a dedicated young acolyte who was willing to lay down his life forhis [*sic*] fellow man might have walked into the containment chamber at [Three Mile Island] and shut things down early in the situation."[159] Sebeok instead

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[156] Ibid.
[157] Bruce A. Luthanen to Thomas A. Sebeok. November 12, 1984. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[158] William B. Edwards to Thomas A. Sebeok. November 26, 1984. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[159] Ibid.

meant that religion would be used to compel outsiders away from exclusively nuclear waste sites.

Thomas Sebeok's replies to these letters are telling as well. Sebeok replied to Luthanen and Edwards' letters very briefly, telling them simply to read his actual report instead of relying on fallible newspaper articles. In his response to Luthanen, Sebeok demonstrated clear annoyance: "I advise you to read my published report instead of criticizing a newspaper article for which I am niether [*sic*] responsible nor have read," and dismissing Luthanen's critiques out of hand because Luthanen had not read the actual report.[160] In many ways, Sebeok did not seem particularly open to critique, at least not from the general public. Sebeok frequently commented that he himself had not read newspaper articles about his ideas. He expressed some anger that newspaper articles had so frequently misrepresent his positions.

Sebeok did respond to one letter in detail, however, and this response perhaps constitutes Sebeok's most complete defense of his ideas. While Sebeok, by his own admission, did not read most of the newspaper articles about the atomic priesthood, he was sent a clipping of Denman's *Anthropology Newsletter* article by David R. Howell. Sebeok wrote a response to Howell, addressing many of Denman's points. Sebeok first explained that his report "was intended to start a public debate on the part of not only the scientific community but also the citizenry at large," hinting perhaps that his suggestions were not expected to actually be implemented.[161] He went on to argue that Denman exaggerated the atomic priesthood proposal, writing "in my report, I clearly state that folkloristic devices briefly mentioned should be 'supplementary' to a

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[160] Thomas A. Sebeok to Bruce A. Luthanen. November 14, 1984. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[161] Thomas A. Sebeok to David R. Howell. February 7, 1985. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.

host of other techniques."[162] Sebeok stressed that the atomic priesthood was a small part of the overall proposal, and that he only "briefly" mentioned it. Sebeok further responded to Denman's criticism of the atomic priesthood's scientific elitism, writing that the artificial myths constituted only the "rudimentary" level of message, which would be "necessarily limited by the space available in the channel."[163] In other words, the message passed along as a myth would necessarily have to be simple: an injunction against entering nuclear waste sites, and nothing else. But Sebeok reiterated that this was one of many messages; there would also be "four further message levels of increasing complexity, the highest of which includes detailed technical information accessible to any human being capable of reading."[164]

Sebeok's experiences with his readers clearly impacted his own maneuvering with the meaning of the term. No matter how diplomatic he was, or tried to be, with his enraged readers, however, Sebeok continued to publicize the term, turning from one radical medium to another. The following section examines the way in which the "atomic priesthood" moved from newspaper articles, science fiction, and official government reports and played out in the realms of fine arts. Much as science fiction could be used to debate serious scientific issues, Lerman's dance brought discussions of the problem of nuclear waste into the world of dance.

Part 7. The Afterlife of Sebeok's Proposal: Staging the "Atomic Priesthood" as a Dance

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[162] Ibid.
[163] Ibid.
[164] Thomas A. Sebeok to David R. Howell. February 7, 1985. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.

In 1987 the choreographer Liz Lerman directed a dance performance entitled "Atomic Priests."[165] As a dance performance the term acquired yet another meaning. Lerman's performance opens a window into the "afterlife" of Sebeok's proposal at the time when the Cold War had significantly de-escalated (and would come to a perceived end with the dissolution of the Soviet Union in 1991). Lerman's performance signaled that the problem of nuclear waste would continue as the most enduring legacy of the Cold War.[166] In other words, despite the hopes of the post-Cold War era, nuclear waste as the human past would continue to haunt us.

Liz Lerman, an American choreographer and a dancer, was born in Los Angeles in 1947. She danced from a young age, taking classes from the age of 5, and initially aspiring to be a ballerina.[167] With her dance company, the Dance Exchange, she staged performances across the U.S. as well as abroad. Lerman explored varied concepts in her dances; for example, she created a side group "Dancers of the Third Age," made up solely of older performers.[168] She frequently used dance as charity work; indeed, her Dance Exchange was operating on a $1000 monthly deficit as of the early 1980s.[169] Another quirk of Lerman's dances was a consistent use of the spoken word: a biographical *Washington Post* article noted that Lerman "[loved] words and [had] used them in her dancing since her first piece of choreography."[170] Lerman's most famous

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[165] This section draws on archival materials from Sebeok's personal papers and from Lerman's Dance Exchange papers at the University of Maryland.

[166] "1989: Malta Summit Ends Cold War," Home - BBC News, http://news.bbc.co.uk/onthisday/hi/dates/stories/december/3/newsid_4119000/4119950.stm (accessed March 16, 2018).

[167] Michael Kernan, "Liz Lerman's Giant Step," *The Washington Post*, 3 May 1981, https://www.washingtonpost.com/archive/lifestyle/1981/05/03/liz-lermans-giant-step/06e5631d-92d4-457d-a34a-6f59b245c2af/?utm_term=.fe681bdac5f9.

[168] "Dance Exchange: History," http://danceexchange.org/about/history/ (accessed March 16, 2018).

[169] Kerman, "Liz Lerman's Giant Step."

[170] Alan M. Kriegsman, "Liz Lerman, Democrat of Dance," *The Washington Post*, 26 Apr. 1987, https://www.washingtonpost.com/archive/lifestyle/style/1987/04/26/liz-lerman-democrat-of-dance/32be4688-6b60-4537-a4a7-8d6555ab69e8/?utm_term=.02f5fa08c363.

work used dance as a medium for political and social critique. In particular, her series of "docudances" were, in the words of one reviewer, "political lampoons that [satirized] the evil and inanity she [saw] within various aspects of U.S. government policy" and were frequently "based on excerpts from government documents and other official material."[171] To this effect, Lerman's "Docudance 1990: Dark Interlude" criticized government censorship of art, focusing on the obscenity charges levied against Robert Mapplethorpe's photography, while her "Reaganomics" docudance criticized the economic policy of Ronald Reagan and David Stockman.[172] Lerman's "Atomic Priests" dance should be understood in the context of her use of dance to foster social critique. Lerman's performance satirized the project of the Human Interference Task Force and Sebeok's proposal of an atomic priesthood, at the same time attracting the public attention to the problem of nuclear waste.

In May 1988, Thomas Sebeok learned about a dance performance inspired by his atomic priesthood proposal. Shortly thereafter, Sebeok wrote a letter to Liz Lerman, the choreographer and director of this dance. He was clearly far more interested in Lerman's work than in other responses to his idea, despite her critical stance. In his letter, Sebeok explained that he "was surprised to learn from a friend of [his] at the University of Chicago – who witnessed one of [her] performances" that his report, "Communication Measures to Bridge Ten Millennia" had been choreographed.[173] Sebeok expressed his interest in the performance, adding that he "would very much like to learn more about your imaginative (and flattering) undertaking and, of course,

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[171] Suzanne Levy, "Lerman's Compelling Dreams," *The Washington Post*, 2 May 1988.
[172] Pamela Sommers, "Liz Lerman's Barns Dance," *The Washington Post*, 10 May 1991.; Kriegsman, "Liz Lerman, Democrat of Dance."
[173] Thomas A. Sebeok to Liz Lerman. May 26, 1988. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.

to see it if possible," whether by videotape or by arranging a performance at Indiana University.[174] Moreover, Sebeok offered to help Lerman organize such a performance at his university. A friendly correspondence followed. In their letters, Sebeok and Lerman talk about their children's lives, their various academic projects, and other casual topics. Lerman sent Sebeok a videotape of her "Atomic Priests" performance, and Sebeok sent her in return a copy of one of his books.[175] Sebeok wrote that he "was very pleased to run [the tape of "Atomic Priests"] off twice over the week-end for [himself], [his] wife, and [his] daughters," and that he found the dance to have been "most skillfully done" and "soberly and responsibly satirical."[176] Sebeok also invited Lerman to the Cosmos Club so they could meet in person on December 7th, 1988.[177]

Sebeok put significant effort into organizing a performance of "Atomic Priests" at his university. He wrote to Indiana University Dean of Faculties Anya Royce (a ballet dancer herself) in September 1988 about Lerman. Sebeok wrote that he thought Royce "should see these materials and know about [Lerman's] work."[178] He also gave Royce's contact information to Lerman, and the Dance Exchange eventually contacted Royce about organizing a performance. Dance Exchange Performance Manager Bob Fogelgren wrote to Royce in December 1988. The letter pitched the Dance Exchange in the following way: Fogelgren wrote that "The Dance Exchange offers a wide variety of programs … including formal and informal performances …

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[174] Ibid.
[175] Thomas A. Sebeok to Liz Lerman. September 12, 1988. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[176] Thomas A. Sebeok to Liz Lerman. September 12, 1988. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.
[177] No record documented this meeting, nor did they discuss the meeting in later letters. It is not certain whether this meeting indeed took place as planned.
[178] Thomas A. Sebeok to Anya Royce. September 6, 1988. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.

classes, and workshops."[179] He continued: "during the past several years, our residencies have brought us into contact with many college and university around the country including Columbia … Juniata College … Bennington College … Dartmouth College."[180] In this way, Fogelgren and the Dance Exchange advertised themselves to Indiana University.[181]

Liz Lerman clearly saw her "Atomic Priests" dance as a way to discuss the problems of nuclear waste and the American "atomic priesthood" through a new medium. Lerman described her goals for "Atomic Priests" in the grant proposals submitted to Wallace Funds and The Reed Foundation. The "Objectives" section of these proposals laid out Lerman's main goals for the performance. She wrote that "the overall goal of the project [was] to make a dance - or a set of "ritals" [*sic*] - based on the Department of Energy's study in order to prompt audiences to ask questions about their own responsibilities to future generations."[182] The language in this section mirrored the grant proposal's earlier description of the HITF's report, which suggested "the development of a series of rituals or ceremonies that 'would be tantamount to laying a "false trail," meaning that the uninitiated [would] be steered away [by] accumulated superstition.'"[183] In essence, then, Lerman proposed to use "rituals" just as the HITF would, but her goal was not to protect nuclear waste sites; instead, she wanted to prompt discussion of the issue among wider public. The grant report continued, making an argument for the way in which a dance could contribute to discussions of nuclear waste:

With all the media coverage and written material available on nuclear waste disposal, how will a dance make a contribution to increased understanding? Dance, like all art forms, reaches

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[179] "Dances of the Third Age, Thomas Sebeok, Indiana University," Liz Lerman Dance Exchange Archives, Special Collections, University of Maryland Libraries.
[180] Ibid.
[181] I could not find any record of a performance of "Atomic Priests" taking place at Indiana University.
[182] "Wallace Funds, 'Atomic Priests,'" Liz Lerman Dance Exchange Archives, Special Collections, University of Maryland Libraries.
[183] Ibid.

people's emotions. In addition, the approach the Dance Exchange takes is to provide information and facts, as well as a feeling context for the work. This makes it possible for people to respond on both a feeling and a thinking level.

Lerman stressed that her dance could uniquely contribute to the discussion surrounding nuclear waste, prompting people to respond "on both a feeling and a thinking level."[184] As Lerman argued, this kind of thought was unique to dance and art in general, and could add to the discussion in a different way than scientific papers or news reports.

Lerman's dance invited comparisons to the exploration of the theme in science fiction. Indeed, both were works of art which provided a radical medium for an open-ended and imaginative commentary on real-world scientific problems. A review of "Atomic Priests" in the *New York Times* anticipated the comparison noting that Sebeok's proposal "[was] not science fiction."[185] A review published in *Dance* magazine in 1988 articulated a similar sentiment, comparing Lerman's choreography to "a post-holocaust *Star Trek* [with] mysterious elders executing rituals in a clearing in the distant future."[186]

What was the actual performance of "Atomic Priests" like? How it would have been seen in the late 1980s? I was given access to the recording of Lerman's "Atomic Priests" by the University of Maryland Archive's digital collections. The performance I viewed was recorded in September 1989; this performance took place around two years after the dance debuted. The video itself was somewhat grainy, and the audio quality was substandard. For many parts of the dialogue-heavy performance, I was unable to clearly hear exactly what the actors were saying.[187]

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[184] Ibid.

[185] Jack Anderson, "THE DANCE: LIZ LERMAN," *The New York Times*. 26 Oct 1987, http://www.nytimes.com/1987/10/27/arts/the-dance-liz-lerman.html (accessed November 06, 2017).

[186] Thomas A. Sebeok and Jean Umiker-Sebeok, *The Semiotic Web* (Berlin: De Gruyter, 1986), 328.

[187] Further, in the video, "Atomic Priests" was included along with several other seemingly-unrelated dances by Lerman, such as "Sketches from Memory." "Atomic Priests" had two parts: "Coming

"Atomic Priests" is introduced by an unseen narrator saying "Once, in a land far far away, a small band of people who called themselves the Department of Energy … conjured up your deepest, darkest fears. Let that fear run wild!"[188] The spotlight slowly illuminates one man, dressed in a suit and tie, sitting on a folding chair. He sings: "Abstract 3: the disposal of radioactive waste in deep geologic formations."[189] The spotlight moves to illuminate several other figures, male and female, also dressed in formal business attire. They join into the choir, in a kind of call and response manner, responding to the main singer's lines with affirmations such as "uh-huh" and "okay."[190] These formally-dressed men and women were intended to represent the Human Interference Task Force having a meeting. This scene continued to describe the problem identified by the Task Force: "since we do not know what language the future people [will use] … appropriate steps will be taken to communicate the existence of the repository through symbols, through icons, pictographs, and through myth."[191]

The lights dim, and the next segment is introduced by the narrator: "These are the pictograms, created by some of the greatest minds of the 20th century. This fascinating piece of work was intended to warn future generations away from nuclear waste repositories. See these pictures come to life before your very eyes."[192] The "pictograms" take the form of several short, abstract dances by black-clad figures. There are five such "pictures," after which the lights dim again. The narrator speaks: "Be there at the moment of inception … 'Reducing the Likelihood of

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Attractions" and "The Feature." In the videos I was able to find, only "Coming Attractions" was included; I was not able to watch "The Feature."

[188] Liz Lerman and The Dance Exchange, "Sketches from Memory, Atomic Priests, Reenactments, September, 1989," Digital Collections @ the University of Maryland, September 1989, https://digital.lib.umd.edu/video?autostart=true&pid=umd:683127.

[189] Ibid., 24:40.

[190] Ibid.

[191] Ibid., 26:00.

[192] Ibid., 27:00.

Future Human Activities That Could Affect Geologic High-Level Waste Repositories' the Human Interference Task Force prepared for the friendly folks at the Office of Nuclear Waste Isolation - ONWI. And remember: they did it all for you."[193] Another meeting scene follows. The scientists discuss how they plan to prevent disturbance of nuclear waste into the far future. They emphasize their points with a series of symbolic gestures. For example, when any of the scientists said "waste," they pound one hand into the open palm of the other, simultaneously dropping their head.[194] When one scientist mentioned the possibility of "natural events and processes" disturbing nuclear waste sites, all of the scientists shake violently, suggesting an earthquake.[195] One scientist eventually articulated the main point, saying: "notwithstanding, considerable concern has been put by certain groups … that some time after the repository has been sealed, perhaps far in the future, humans may engage in some activity at or near the repository site that could cause waste isolation to be severely diminished."[196] Another scientist responded: "To be more concise and to the point … not to mention less wordy, verbose, there is considerable concern that in the future the waste may be removed."[197] However, as this scientist continued, dangers to the nuclear waste through war or terrorism "should not be significant."[198] "So," she concluded, "don't worry about the future."[199]

The dance ends with a brief "trailer" for the next part of "Atomic Priests." Dancers portray "our descendants" in the "turbulent world of the future" as they "[played] out their

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[193] Ibid., 30:00.
[194] Ibid., 31:00.
[195] Ibid., 32:00.
[196] Ibid., 33:00.
[197] Ibid., 33:30.
[198] Ibid., 34:30.
[199] Ibid., 35:00.

destinies in the ultimate scavenger hunt."[200] In this section, two of the earlier scientists, as well as three others, dance to futuristic and industrial sounding music. These dancers mimic the "pictograph" dances seen earlier. For example, in both segments, dancers mimed picking a piece of fruit, eating it, and then rubbing their stomachs.[201] The dance ends with the narrator introducing the next part of the dance: "'Atomic Priests: The Feature' coming to your neighborhood soon."[202]

"Atomic Priests" both satirized the HITF ideas and invited public to engage with them critically. "Atomic Priests" stressed throughout the idea of using symbols and myth to communicate with the far future, translating some of the ideas of the HITF and Sebeok into dance form, while simultaneously criticizing the ideas, science, and the nuclear industry. The scientist-dancers use a consistent repertoire of body language along with their speech; they have specific symbols for the phrases "Department of Energy," "waste," "long periods of time," etc. Further, the dancers in "The Feature" mimic the movements of the earlier dancers in the "pictograph" section: in this way, Lerman showed the transmission of symbols into the far future through embodiment.

Satire on the Human Interference Task Force is apparent throughout the dance. Certain statements made by the narrator are clearly ironic and meant to criticize. For example, the statement that the HITF was made up of "some of the greatest minds of the 20th century" was met with roaring laughter from the audience.[203] Indeed, the play was seen as humorous throughout, and laughter was frequent in the recorded version I watched. The behavior of the

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[200] Ibid., 35:30.
[201] Ibid., 37:00.
[202] Ibid., 37:30.
[203] Ibid., 27:00.

dancers representing scientists further served as a critique, both of the HITF and of science in general. The scientists were portrayed as frivolous and child-like, and they frequently bickered. In particular, a male scientist and a female scientist seemed to be in conflict throughout. At one point, the female scientist sat in a seat, to which the male scientist responded by tapping her on the shoulder and angrily signaling for her to move.[204] The scientists also used childish phrases such as "okie dokie."[205] Their movements were childish and silly. The "pictograph" of the Department of Energy was particularly humorous: to represent the DoE the scientists vigorously run in place.[206]

Lerman presented the HITF as simultaneously childlike and comical, a scary and dangerous in its activities and assumptions. If nothing else, the dance captured fears about the unregulated power of science. The theme of fear is explicit right from the beginning of the play, as the narrator instructs the audience to "let [their] fear run wild."[207] In a later example, the narrator referred ironically to the "friendly folks at the Office of Nuclear Waste Isolation," menacingly reminding the audience that "they did it all for you."[208] Lerman portrayed the HITF as both menacing and dangerous in their unchecked power, and laughable in the ridiculousness of their proposals.

Surprisingly, Sebeok himself was seemingly happy with Lerman's interpretation of his ideas. In a letter to Lerman, he praised "Atomic Priests" as "soberly and responsibly satirical."[209] Sebeok would reiterate a similar sentiment in a published form: in *The Semiotic Web*, Sebeok

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[204] Ibid., 26:30.
[205] Ibid., 25:00.
[206] Ibid.
[207] Ibid.
[208] Ibid., 30:00.
[209] Thomas A. Sebeok to Liz Lerman. September 12, 1988. Thomas Sebeok Papers, Indiana University Bloomington Special Collections.

again praised "Atomic Priests" as "soberly satirical … rendered with wit and gentle humor."[210] Given the extremely critical nature of "Atomic Priests," and given Sebeok's reaction to criticisms of his idea in newspapers and letters, it might be surprising to see such a favorable response. Yet, given Sebeok's own endorsement of the multiple meanings of the term, it may well be that Sebeok agreed with Lerman that "Atomic Priests" held value in sparking discussion and allowing audiences to think about the problem of nuclear waste "on both a feeling and a thinking level."[211]

Conclusion

Neither Sebeok's own proposals nor those in the Human Interference Task Force report were implemented or officially endorsed by the U.S. government. As Sebeok wrote in 1989, a Nuclear Waste Technical Review Board had been created in the U.S. -- a "quite prosaic version" of Sebeok's originally-proposed atomic priesthood. Though no official atomic priesthood was ever implemented, the idea continues to live on in the popular imagination. A website created in 2009, The Atomic Priesthood Project (APHP), is named after Sebeok's idea. The organization lists its timeframe as "01984 - 99999+."[212] Their mission statement reads:

> Radioactive waste materials remain volatile to organic life for tens of thousands of years in the near term, millions of years on the far end. These materials, the history of their creation, and the infrastructures necessary for their containment will require stewardship of relevant information in order to protect endemic and pandemic populations from contamination and contact from highly radioactive (hi-rad) substances. The system(s) employed to communicate this array of information must create conditions whereby corruption and decay of the information itself is minimized. A proposed group of

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[210] Thomas Sebeok and Jean Sebeok, *The Semiotic Web*, 328.
[211] "Wallace Funds, 'Atomic Priests,'" Liz Lerman Dance Exchange Archives, Special Collections, University of Maryland Libraries.
[212] The Atomic Priesthood Project, http://theatomicpriesthoodproject.org/ (accessed March 16, 2018).

> individuals in every generation would self-select members to retain, elaborate, and perform the information mythologies of these sites and the materials within.[213]

The founders of the APHP evidently see themselves as this group. Sebeok himself, however, increasingly backed away from his "atomic priesthood" proposal as he grew older. In a 2003 documentary, Sebeok commented on his atomic priesthood:

> And so I made an invention, but this was a mistake that I made, I called this group the atomic priesthood and there were many criticisms of this. First of all I used the word "priesthood." This offended a lot of people. They said, "Priesthood, what a stupid phrase. " I said, "No, all I meant was a committee, but I do not like committees; either way I thought it would be elegant to call them an atomic priesthood." … Wise men, you can call them, in an informal committee and they resign or they would, themselves, appoint new people from the sciences, from public life, from the legal profession, medical doctors and so on. Now this group wants to exist in the future. All we ask for is that [the waste sites] have been repaired, that they have been brought to fruition. Just to make sure this warning system continues from generation to generation.

It seems that, by the end of his life, Sebeok did not see much value in his provocative phrase. But the questions Sebeok was addressing remain relevant. Not much has changed since Sebeok wrote in the early 1980s. Several recent documentaries such as *Containment* (2015), *Journey to the Safest Place on Earth* (2013), and *Into Eternity* (2010) have wrestled with the issue of storing the ever-increasing worldwide supply of radioactive waste. These films mention the long time-scales created by nuclear waste, and the difficult problem of preventing accidental human intrusion. They indicate that not only does nuclear waste continue to be produced, and not only there still is not a long-term solution, but people are still very concerned about the issue. Further, recent North Korean nuclear weapons tests, emerging problems with the Iran nuclear deal, and increasing U.S.-Russian conflicts suggest a potential return to Cold War nuclear tensions in the near future. This makes a permanent plan for nuclear waste even more vital for the near future.

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[213] Ibid.

Sebeok's proposal of an atomic priesthood to manage long-term nuclear waste sites is interesting and holds value even today. In all likelihood, a pseudo-religious body managing waste would be met with outrage today, as it was in the 80s. But Sebeok's priesthood can be interpreted, as he himself interpreted it later in his life, as a secular body. A long-term self-selecting non-governmental body of experts, tasked with watching over nuclear waste sites into the far future, could certainly be useful. This group could act as one of the many messages sent into the far future. Perhaps they would survive, perhaps not. But their presence could not hurt.

The story of Sebeok and his atomic priesthood idea cast new light on Cold War historiography, and the historiography of science and technology in general. With the beginning of the Atomic Age, strong associations were forged between nuclear power and religion. The nuclear bomb was seen as the imminent source of a Biblical apocalypse, and nuclear energy and weapons alike were viewed as God-given power. These themes are well-explored in existing works by Paul Boyer. Sebeok's own work took connections between religion and nuclear power one step further: he literally suggested the use of a religious organization to govern nuclear waste. In this way, Sebeok's proposal can be viewed as the culmination of this long association.

Sebeok's proposal occupies a similar relation to science fiction. Historians such as Joanna Radin have noted the ways in which sci-fi and bona fide science intertwined. Many science fiction writers had educations in science, and explored important scientific themes in their works of fiction. Sebeok's proposal for an atomic priesthood, again, can be viewed as the culmination of this association: his idea for an atomic priesthood was taken directly from the science fiction writings of Arsen Darnay. Sebeok was a scientist who recognized the valuable

ideas in science fiction, and gave one of them a home in a serious government proposal. Sebastian Munsch, in the sole scholarly article on Sebeok's atomic priesthood, described the connections between Sebeok's work and science fiction. I have built on his work with further analysis of the sci-fi themes which Sebeok incorporated, as well as by bringing in further information about Arsen Darnay and his writings. I also analyzed Sebeok's use of sci-fi as inspiration in relation to the genuine scientific themes in many sci-fi works.

The question remains of how to interpret Lerman, and Sebeok's surprising approval for her work. Perhaps, considering Sebeok's changing presentation of his atomic priesthood later in life, he actually agreed with Lerman's criticisms. Or perhaps Sebeok saw her dance as a way to broaden the discussion. Sebeok's own report was unlikely to be read by many outside of government officials or scientists. But through Lerman's dance, the discussion could be spread to the art world, and to the general public. A dance could be easier to understand than a full-length report, while raising the same concerns. Perhaps Sebeok did not care that his idea was being criticized: the fact that more people were thinking of the problems of nuclear waste was enough.

One of my initial impressions when beginning to research the Sebeok's atomic priesthood was one of confusion. I wondered what motivated Sebeok to recommend something as outlandish as he did. He must have known, I thought, that the creation of an artificial nuclear religion would be rejected. Perhaps Sebeok did know that his idea would be seen as crazy. His approval for Lerman's critical dance suggests that Sebeok was willing to embrace controversy. Perhaps the immediately-interesting and possibly-offensive idea of an atomic priesthood was meant not as a completely serious recommendation, but to spark discussion of the problems of nuclear waste into the future. The idea itself could serve the purpose assigned to Sebeok's atomic

priests: keeping concerns about nuclear waste in the public imagination through a memorable and intriguing idea. Under this interpretation, my paper itself is a sign that Sebeok's plan worked. Discussions of Sebeok's atomic priesthood continue more than thirty years after he proposed it, and the idea remains immediately interesting.

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