

Modernizing the Deathcare System

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“Death was once viewed as a natural part of life and encountered with equanimity in the West; however, this perception changed over time, and in the modern period death became denied, invisible, medicalized, and something to be feared” (Shelvock et al. 644). Over the years, studies have consistently shown the negative impact that current death practices have on the environment and on our health. The pollution caused by cemeteries and crematoria is capable of contaminating the water, soil, and air, resulting in disease and damage to ecosystems. In recent years, the modernization of death care systems has seen eco-death advocates fighting to re-naturalize and re-familiarize death by introducing “green death technology” (The Order of the Good Death 2023). In many states, options for disposition are limited to burial or cremation. The modernization of the death care system presents the public with innovative, cost-effective, and environmentally friendly options for disposition. With an ever-increasing global population, and thus an ever-increasing need for death care, it is important to examine eco-friendly alternatives to traditional death practices and move society forward by implementing necessary changes to methods of disposition in order to ensure that life can thrive after death.

“Traditional” funerals in Western society are often associated with a full-service memorial and a luxurious casket that is buried in the ground (Shelvock et al. 648), along with the option of cremation, which has become a popular, less-expensive alternative to burial. In 2021, many US states saw a significant increase in cremation rates. The National Funeral Directors Association (“NFDA”) *2022 Cremation & Burial Report* predicted that this year the cremation rate will reach close to 60%, with the national cremation rate reaching 80% by 2035

(Marsden-Ille 2023). While traditional burial has long been the preferred funerary rite for families, it has become increasingly cost-prohibitive. With an average cost of around \$7,848 (not including cemetery fees or vault), and \$6,971 for cremation in 2021 (NFDA), more people are looking for more affordable and/or eco-friendly options.

The corporatization of the funeral industry is a major contributor when examining the increase in funeral costs. Doug Smith, author of *Big Death: Funeral Planning in the Age of Corporate Deathcare*, has noted that a select few corporations, which he refers to as “Big Death,” have purchased numerous regional and family-run funeral businesses in the last forty years stating, “these corporations maintain a deceptive appearance of a local business by continuing to operate under the original funeral home name in the communities where they were initially established” (Shelvock et al. 645). Under the guise of a locally-run funeral home, funeral directors are pressured by these corporations into pushing the sales of more expensive caskets or urns. In Ontario, Canada, some journalists have reported on discrepancies amongst community members who have described “aggressive funeral sales practices that target recently bereaved individuals; that pre-paying for funerals is ineffective in avoiding expenses due to hidden fees; and caskets and urns are consistently subject to excessive price markups from wholesale price lists, ranging from 150% to 400% per item” (Shelvock et al. 645). As funeral director and poet, Thomas Lynch, puts it:

A funeral is not a great investment; it is a sad moment in a family’s history. It is not a hedge against inflation; it is a rite of passage. It is not a retail event; it is an effort to make sense of our mortality. It has less to do with actuarial profits and more to do with actual losses. It is not an exercise in salesmanship; it is an exercise in humanity (“Funerals ‘R’ Us”).

Financial woes are only one part of the negative impact of traditional funeral practices. As a result of traditional burial, over a million tons of hardwood, metal, concrete, and over three quarters of a million gallons of embalming fluid are buried in US cemeteries each year (Olson 676). Many caskets pose a risk as the metals utilized in their construction can deteriorate and corrode into harmful toxins when buried, leading to various contaminants leaching into the surrounding soil. For example, wood caskets contain varnishes, sealers, and wood preservatives; metal casket contaminants include steel, copper, zinc, and lead, which are poisonous to living creatures (Shelvock et al. 648). Studies in New York and Iowa found elevated levels of arsenic in groundwater “downstream” of late 19th-century cemeteries, as well as higher levels of copper, zinc, and lead—elements used in caskets (Chiappelli & Chiappelli 24). Reports show that cemetery pollution can produce an alteration in microbiological components, and increases the prevalence of heavy metal and toxic organic pollutants in soil, subterranean water, and even in the air (Franco et al. 2).

Depending on the region, high levels of precipitation coupled with lack of cemetery maintenance increases the chance of the surrounding land and water being contaminated by *necroleachate*, an effluent rich in organic matter and inorganic elements produced during decomposition of corpses (Franco et al. 2), which is capable of carrying viruses, bacteria, and protozoa down through the soil into the aquifer (Fernandes 77). If contaminated, the aquifer may transmit waterborne diseases such as, tetanus, food poisoning, typhoid fever, or tuberculosis (Fernandes 86). The issue of contamination is intensified in urban cemeteries, where absence of management and treatment of the effluents emitted by decomposing bodies can lead to contamination of a larger area. Cemetery operators must take extra care in construction and

maintenance of gravesites in order to prevent the spread of necroleachate. Grave vaults and liners can be used to protect the casket from the elements and to contain any leachate that may escape the casket, though these, too, are less than ideal due to the large quantities of non-renewable resources used in their construction. Embalming is another method used to slow decomposition and the spread of necroleachate.

The modern practice of embalming dates back to the American Civil War. The army, faced with the problem of shipping dead soldiers home, commissioned Dr. Thomas Holmes to develop a method of preservation. Arsenic was used as the main ingredient because it was effective in killing the microorganisms responsible for decomposition (Chiappelli & Chiappelli 24). “Embalming is designed to keep a cadaver looking fresh and uncadaverous for the funeral service, but not much longer” (Chiappelli & Chiappelli 25). Essentially, embalming is used to create a “memory picture” to be on display at a funeral, to help loved ones cope with the process of letting go (Alfus 329). Arsenic-based embalming lasted until the early 1900s when it was banned due to harmful effects on health and because it interfered with criminal investigations of cases where arsenic poisoning was suspected (Chiappelli & Chiappelli 24). Nowadays, embalming is commonly done using a formaldehyde-based solution.

To embalm a body, “the embalmer first drains the blood and replaces it with three to six gallons of a dyed and perfumed solution of formaldehyde, glycerin, borax, phenol, alcohol, and water—the embalming fluid does not prevent decomposition, but merely slows it” (Alfus 330).

Studies show that more than half of Americans believe that embalming is legally required, or that embalming is required before cremation (Chiappelli & Chiappelli 25). Typically, a body is embalmed for purposes of preservation and presentation only. Embalming has become

a cultural norm in the United States, but is not legally mandated in any state (Alfus 329). The reason for this belief may be a lingering result of the fear of contamination from contact with dead bodies that was popular during the Civil War. “It was recognized that personnel who worked with decomposing bodies in cemeteries and churches might become ill, but no one understood the mechanism by which this occurred—it was thought that embalming would make handling corpses safer” (Finney 478). Embalming does not kill disease however, but in cases of communicable disease, a dead body is considerably less hazardous than a living one (Alfus 329-30). A study in the UK suggests that rather than helping the public health, “embalming actually harms the public health by exposing embalmers to the bodily fluids of the deceased” (Chiappelli & Chiappelli 26).

Those who work with cadavers are at a risk of developing acute or clinical symptoms and even develop a higher risk of cancer after prolonged/repeated formaldehyde exposure. General fatigue and burning of the eyes and nose are the most common symptoms reported by students during anatomy classes (Soonklang & Saowakon 65642). Because the bodies in these classes need to last longer than the length of a funeral service, anatomy departments use much higher concentrations of embalming fluid (Chiappelli & Chiappelli 27). Formaldehyde can cause clinical symptoms depending on concentration, duration of physical/contact exposure, and room ventilation. Short-term exposure to formaldehyde at a lower concentration (0.1-0.5 ppm) can cause acute symptomatic responses such as upper respiratory and eye irritation, numbness, and rashes on the skin; long-term or prolonged exposure to formaldehyde at higher concentration (0.5-2 ppm) can affect the nervous, immune, and respiratory systems (Soonklang & Saowakon 65642-43). The most common reported clinical symptoms are unpleasant odor (52.5%), fatigue

(50%), dizziness and headache (41.25%), burning eyes (38.75%), and burning nose (31.25%) (Soonklang & Saowakon 65650).

The International Agency for Research on Cancer (“IARC”) has classified formaldehyde as a Group 1 carcinogen for humans (2004), based on toxicological data and epidemiological evidence obtained in workplaces where formaldehyde is present (Protano et al. 1). Formaldehyde also enters the atmosphere through cremation, and once in the air, can last for up to 250 hours (in good weather). Formaldehyde breaks down into formic acid, which is itself hazardous, and then into carbon dioxide (Chiappelli & Chiappelli 25). Because formaldehyde is highly soluble, “it readily attaches to atmospheric moisture and washes out in precipitation” (Chiappelli & Chiappelli 25).

Since embalming slows decomposition, it can mitigate the spread of necroleachate into the soil for a time. However, if leachate from an embalmed corpse ends up leaching into the soil, it can cause further damage to the environment due to the toxic embalming chemicals. Freezing is the most viable alternative for preventing decomposition in the short term since “it preserves the body in a way that does not require toxic chemicals” (Chiappelli & Chiappelli 26). However, with the growing popularity of cremation in place of traditional burial, unless there is a memorial service prior to cremation, we will likely see less cases of embalming in the future.

Although cremation is a great alternative to burial when it comes to cutting costs and saving space in cemeteries, the process emits many harmful chemicals into the environment through the air. This pollution is intensified if the cremated individual has dental amalgam fillings, which each contain more than 0.5g of mercury that is released into the atmosphere upon incineration (Mari & Domingo 132). According to the Cremation Association of North America,

“cremation is the mechanical, thermal, or other dissolution process that reduces human remains to bone fragments” (Alfus 330). Crematoria use nonrenewable fossil fuels to incinerate human remains, and emit greenhouse and other poisonous gasses, and vaporized mercury into the atmosphere as a result (Olson 676). The process produces small particles, trace gasses, and toxic organic volatiles (Franco et al. 1). The pollutants emitted by the combustion of organic matter with presence of other trace elements (e.g., metal implants, dental fillings) are: combustion gasses (NO_x, CO, SO₂), heavy metals, and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), among other persistent organic pollutants. “Heavy metals and PCDD/Fs stand out because of their toxicity and capacity for bioaccumulation, which means potential risks for human health” (Mari & Domingo 131). PCDD/Fs are created on particles of soot, enabling the hazardous chemical to travel away from the incineration site. These particles eventually settle out onto land, contaminating the grass and topsoil. “Contaminated grass enables PCDD/Fs to enter the food chain and it will ultimately be consumed by humans and stored in body fat” (Mari & Domingo 132).

In some cases, the ashes are buried within the urn, which can help protect the environment. However, long-term degradation is not prevented in this way, due to the external surface of the urn corroding and releasing the ash and heavy metals, such as: zinc, copper, nickel, and chromium into the soil (Franco et al. 5). Elevated levels of these metallic elements in the bloodstream can cause damage, such as: liver disease (zinc), problems in human neurological systems (copper), problems in the central nervous system (iron), and lung cancer in humans (chromium), as well as nickel being classified as a human carcinogen (Franco et al. 2).

Consumer empowerment, cost savings, and Catholic acceptance are what helped fuel the “cremation boom” in the United States in the early 1960s, and which is now widely recognized

as a dominant trend in contemporary US death practices (Olson 671). The NFDA 2022 report indicated that 41% of consumers opted for direct cremation, with 35% choosing a memorial service, and only 24% opting for a casketed service (Marsden-Ille 2023). According to the Cremation Association of North America, “cremation will supplant embalmed earth burial as the leading disposition method in the United States within the next fifteen years” (Olson 671). This increase in popularity will only lead to greater environmental pollution and likely price increases for cremation services. With the modernization of death practices, what are some more affordable and eco-friendly alternatives?

The terms “green burial” and “natural burial” refer to “methods of final disposition that aim to minimize environmental impacts by minimizing the use of land, chemicals, and traditional caskets” (Alfus 331). The green burial movement is driven by environmental sustainability, consumer cost savings, aesthetics, and a desire to lessen the dependence on mediation of funeral professionals (Olson 678). The Green Burial Council (GBC) is a nonprofit organization that has established the standards for providers of green burial services (Alfus 331). Under GBC’s standards, “the dedication of land for green burials (‘green cemeteries’) can take three forms: hybrid cemeteries, natural burial grounds, and conservation burial grounds” (Alfus 331). Hybrid cemeteries are “conventional” cemeteries that do not require vaults and “must allow for any kind of eco-friendly, biodegradable burial containers, such as shrouds and soft wood caskets” (Alfus 331). Natural burial grounds “prohibit the use of chemicals (embalming or otherwise), vaults, non-native stone, and non-plant-based materials” (Alfus 331). Conservation burial grounds are “established in partnership with a conservation organization and include a conservation management plan that provides perpetual protection of the land according to a conservation

easement or deed restriction” (Alfus 331). Green cemeteries preserve the natural landscapes and use rocks or other natural materials to mark gravesites in place of machine-made tombstones (MacMurray & Futrell 860). The goal of green burial and green cemeteries is to respect the natural process of decay and to minimize the impact of the body on the environment (Chiappelli & Chiappelli 27).

In the United States, 29 states (plus D.C.) have at least one green cemetery. Even though there are no state laws explicitly preventing green burial, cemetery operators all over the country claim “outdated state and local laws have made it difficult for green burial to gain a foothold” (Alfus 331). With current eco-death advocates pushing to spread awareness of green death practices, along with increasing prices of traditional burial, we should expect to see more people opting for a green burial in the near future.

Urban cemeteries can play an essential role in biodiversity conservation, providing places for the preservation of native plants while surrounding areas become excessively urbanized and degraded (Franco et al. 3). A study done in Canada showed the potential of the urban cemetery in Halifax, Nova Scotia to become a forest, which could positively contribute to improving the population’s health, easing the temperature and improving the air quality in the city (Franco et al. 3). By allowing vegetation in cemeteries to grow instead of cutting grass and treating it with pesticides, it becomes feasible to reinvigorate urban cemeteries by planting trees to improve air quality, thereby limiting the proliferation of aromas and toxins generated by the decomposition of bodies (Franco et al. 3). Greenhouse gasses are prevalent in large cities, contributing to air pollution and rising temperatures, but by planting new trees and allowing the native vegetation to flourish in cemeteries, these effects can be mitigated. By changing how urban cemeteries are

planned, constructed, and managed, the general quality of life in these cities can be greatly improved.

Constellation Park NYC is an idea for a public memorial, embedded within the urban life of the metropolis. The creators claim the project conveys “acceptance of the physical finality of death, while recognizing both the endurance and transience of remembrance, and the cyclical nature of organic life”. The proposed system would feature a series of illuminated “biomasses” under the Manhattan Bridge with semi-private, sheltered areas for visitations along with larger, communal spaces available for public functions or funeral services. “Here, the intimate and communal stages of grief are respected, but not cloistered. These spaces of death and remembrance are defined by and continually fortified within the cycles and energies of urban life” (DeathLAB 2021).

While projects like this might seem strange or offensive to the public at first, these more art-driven memorials have the potential to become much more common in the near future. We are already seeing more artistic expression when it comes to memorialization, such as turning cremated remains into jewelry or having your pet taxidermied in their favorite sleeping position. Another example of artistic expression through memorialization is the funeral of New Orleans resident Miriam Burbank in 2014. During her funeral, her body was sat at the table with a glass of whiskey in one hand, a cigarette in the other, and a case of Busch beer by her side. “She was even [seated] below a disco ball as the ‘guest of honor’ at her last party” (BlackNews 2014).

Having a wider range of options for disposition gives us power in our own death, allowing us to be memorialized in more unique ways. Eco-friendly methods of disposition offer both new and familiar ways of memorialization without the harm to the environment that we see with current funeral practices.

Alkaline Hydrolysis is an eco-friendly alternative to flame-based cremation that uses a “reductive chemical process by which tissues are dissolved in a heated (and sometimes pressurized) solution of water and strong alkali (potassium hydroxide or sodium hydroxide), yielding an inert effluent and brittle bone material (calcium phosphate) (Olson 667). The bone material is then placed in a *cremulator* and processed into a fine dust, similar to the ashes from cremation, and returned to the family. The resulting liquid, or *effluent*, is a sterile, neutral mixture of amino acids, peptides, sugars, and soap, and may be used as fertilizer or disposed of through sewage systems (Olson 677). Proponents of alkaline hydrolysis claim the process is a “dignified, respectful, and green alternative to cremation because the process merely accelerates the natural process of decomposition” (Alfus 343).

Minnesota was the first US state to legalize alkaline hydrolysis (2003), thereby sanctioning the Mayo Clinic’s interest in hydrolyzing anatomical donations, with Twin Cities-based Bradshaw Funeral Services becoming the first to offer alkaline hydrolysis as a service in 2012 (Olson 672). Alkaline hydrolysis is currently legal in 28 states. However, this number is constantly in flux as statutes change or, in some cases, repealed. Currently, there are bills waiting for approval to legalize alkaline hydrolysis in six more states (McGee 2023). Although aquamation is legal in 28 states, some states still have funeral service providers who have adopted the technology (McGee 2023). “Mortuary digestors,” the machinery used for alkaline hydrolysis, are “relatively inexpensive; the process does not pollute, as incinerators do. And because no natural gas is used, the process is approximately ten times cheaper than incineration” (Alfus 343). The process uses 90% less energy with over 75% less carbon output than flame-based cremation (Olson 678).

Since the end result of alkaline hydrolysis is one similar to that of cremated remains, this method of disposition should be considered by those planning to be cremated. By opting for this eco-friendly alternative, we can greatly reduce the carbon footprint left by crematoria.

Natural Organic Reduction is another great option when considering eco-friendly alternatives to cremation. On May 21, 2019, Washington State Governor Jay Inslee signed Senate Bill 5001, legalizing a new way to dispose of human remains—“‘natural organic reduction,’ also known as ‘aboveground decomposition,’ ‘recomposition,’ or ‘human composting’” (Alfus 327). Katrina Spade, founder and CEO of *Recompose*, developed the process and infrastructure of recomposition as it was implemented in Washington State (Alfus 342). The process is done by placing a carbon and nitrogen heavy mixture of wood chips, alfalfa, and straw into a container called a *vessel*. The body is then laid on top of the vessel and covered with the same mixture. A fan system is set up to provide air, ensuring enough oxygen is getting to the body, allowing microbes to decompose it (Alfus 342). The body breaks down in about a month, resulting in about one cubic yard of nutrient-rich soil (Recompose 2023). The process is sanitary due to the remains being heated to 131 degrees Fahrenheit, killing off contagion and neutralizing any pharmaceuticals or other chemicals still in the body. “The breakdown of organic matter is an essential component in the cycle that allows the death of one organism to nurture the life of another. Soil is the foundation of a healthy ecosystem. It filters water, provides nutrients to plants, sequesters carbon, and helps regulate global temperature” (Recompose 2023). “The resulting soil is much like the topsoil you’d buy at your local nursery, and is safe to be used in the same way” (Alfus 343). Families may either take the soil home in a bag or place it in an urn, or donate it to a conservation forest.

Spade's model at Recompose states the process "utilizes the principles of nature to return bodies to the land, sequestering carbon and improving the health of our natural surroundings" (Recompose 2023). For every person who chooses recomposition over traditional burial or cremation, "one metric ton of carbon dioxide is prevented from entering the atmosphere" (Recompose 2023). In addition, the process requires 1/8 the energy of traditional burial or cremation. Recomposition allows you to choose an end-of-life option that "strengthens the environment rather than depleting it" (Recompose 2023). Cremation burns fossil fuels and emits carbon dioxide and other particles into the atmosphere. Traditional burial takes up valuable urban land, pollutes the soil and groundwater, and contributes to climate change through resource-intensive manufacture and the transportation of caskets, headstones, and grave liners (Recompose 2023). The overall environmental impact of traditional burial and cremation is about the same.

While these eco-friendly death options seem like the best way to move forward in modernizing the deathcare system, they are not without opposition. For example, the church has made arguments against alkaline hydrolysis with the Catholic Conference of Ohio declaring: "Dissolving bodies in a vat of chemicals and pouring the resultant liquid down the drain is not a respectful way to dispose of human remains" (Olson 674). Alkaline hydrolysis also came under scrutiny in Indiana, where the bill to legalize it had already passed through the House's Public Health Committee and was heading toward legislation. While the bill was under debate, Republican representative Dick Hamm took the floor to give a misinformed speech, aimed to instill fear, declaring "[so] we're going to put [the bodies] in acid, and just let them dissolve away and then we're going to let them run down the drain out into the sewers and whatever"

(Doughty 2022). While the solution used in alkaline hydrolysis is more akin to the exact opposite of acid, the damage had been done. Representative Hamm's speech took what was an uncontroversial, Republican-proposed bill, and ended its progress, resulting in a final vote of 34-59 against legalizing alkaline hydrolysis (Doughty 2022). Although most funeral directors believe alkaline hydrolysis is substantially different from cremation, most of the states that have legalized alkaline hydrolysis have done so by classifying it as a form of cremation—"a strategy that streamlines the legal and regulatory process by allowing [it] to piggyback on the regulatory infrastructure that already governs cremation" (Olson 674).

Natural organic reduction has also been a victim of misinformed announcements. On his Fox News segment, Sean Hannity briefly discussed the process, claiming that now that it was legal in New York, it allowed you to just throw "grandma..your mom..your dad" into your compost pile (Doughty 2023). He followed this up by saying, "now they do have a little process with it and you have to follow it after 30 days...you put it in one pile and then in 30 days you move it to the other pile..." (Doughty 2023). This is a blatant spread of misinformation...not only does he openly mock the process by making jokes about not wanting to eat vegetables "grown with bodies", but he seems to believe (or wants his viewers to believe) the legalization of natural organic reduction means people will be putting bodies in their backyard compost piles. This is simply not true as the process is only legal when performed at licensed, regulated facilities that are regularly monitored and inspected by the state's cemetery and legal boards (Doughty 2023). Eco-death advocates are fighting all over the United States to stop this spread of misinformation and to educate and empower the public when it comes to making informed decisions about our own deaths.

For each of us individually, and at a global level, the impact of death is significant. “Worldwide, two people die every second, and in the United States, 2.5 million people die every year” (McGee 2023). Environmentally friendly methods of disposition, like alkaline hydrolysis or natural organic reduction, can mitigate the harm posed by the sheer volume of the dead. “Death care industries must adapt their practices in the face of climate change and increasing land scarcity” (Alfus 327). If the industry does not advance to fit the needs and values of modern society, the resulting impact on our health and the environment will only worsen with time. While the evidence we do have showing the negative impacts of traditional funeral practices is compelling, more research needs to be done on the health risks and environmental impacts of cemeteries and crematoria in order to cement the need for eco-friendly alternatives. With this, we can work toward a future where, instead of harming the environment and our health, funerary rites can contribute positively to the environment, ensuring life thrives after death.

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