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Culture and Carbon and Cremation, Oh My!

In the late Nineteenth Century, doctors concerned with the unsanitary and crowded cemeteries of the time introduced cremation to the American public (Goetting). While these doctors were initially resisted by religious leaders, cremation eclipsed the popularity of burial over the following century due to its low cost, low direct land use, and its perception as more simple and sanitary than burial (“Why Cremation?”). However, the environmental cost of cremation is substantial and should not be overlooked when making death care decisions. In 2015, the United States emitted 55,000 tons of carbon into the atmosphere by cremating human remains (Knight 1), which is equivalent to the amount of carbon dioxide produced in running 7,500 average houses for a year (“Household CO2”). In order to lower the environmental impact of death care, the United States government must educate the public about postmortem options, implement a variety of measures to limit the carbon output of cremations, and advocate for green burial as the most environmentally friendly death care practice.

Discussions of death in the United States have become taboo; people fear conversations about death, as if merely mentioning the word will bring about their own untimely demise. However, death is inevitable and by failing to acknowledge its reality and certainty, citizens of the United States will make uneducated post-mortem decisions (King-McKenzie 4). People choose cremation because they believe it to be the most flexible, cheapest, and most environmentally friendly method of disposing of human remains (“Why Choose”). However, none of these notions necessarily hold true.

A wide range of burial options are available to the public which lower the economic and environmental cost of death care and create a simpler process of body disposal, such as home funerals in which the bereaved are the primary caretakers of the dead. Organizations like The

Order of the Good Death and Undertaking LA, a Los Angeles funeral home, strive to work with families to create the most meaningful postmortem experience for them, as well as educating the public on their rights with their family members' corpses. Organizations of this variety show how flexible and easy burial can be when families choose not to follow a traditional burial or cremation process and dispel misconceptions surrounding the safety and legality of home funerals (Doughty).

The economic cost of disposing of human bodies includes both necessary charges, such as fees for acquiring a death certificate, and potentially avoidable expenses, such as luxury caskets. One traditional burial can cost a family upwards of \$10,000 in charges for an embalming, a vault, a metal casket, a headstone, a plot, the opening and closing of the grave, and maintenance on the grave (McHugh). Meanwhile, cremations average \$3000, including the urn and the cremation itself. In contrast, one plot for green burial, or the process of burying "unembalmed bodies in biodegradable coffins or shrouds, in graves marked by temporary, disposable memorials, leaving in perpetuity unadorned 'natural' woodland or landscape" (Worpol 3), is a mere \$800; no casket or vault is needed and the body can be shrouded in a simple sheet. There is no cost for a headstone, grave maintenance, or embalming (McHugh). Funeral homes are required to give a broken-down price sheet to any potential customers ("Complying with"), but many consumers do not explore prices and instead choose funeral homes and services based on assumptions about what death care options are available and within their price range ("Price Survey"). By educating the public about the laws governing General Price Listings, the government can encourage individuals to learn the facts of funeral costs and dispel the notion of cremation as the most cost-effective death care option.

While cremations do not require the same scale of land use as burial, that does not mean they are green: cremations consume fuel, emit CO₂, and contaminate the environment with mercury. However, due to the religious and cultural importance of cremation to some communities, an outright ban on cremations is immoral. Instead, there are a number of easy and culturally acceptable ways to limit the carbon emissions of cremations.

The fuel used in cremation is the primary source of CO₂, rather than the corpse itself. The four most prevalent fuels for cremation are diesel, petroleum, electricity, and biomass gas (Achawangkul 463). While all four of these fuel sources emit carbon and are responsible for other environmental degradation, they do so in varying degrees. Diesel and petroleum have comparable greenhouse gas emissions, at 66.8 and 66.2kg of CO₂, respectively (Achawangkul 466). Therefore, in determining which of these fuels is better, we must consider other environmental costs. When diesel combusts, it forms gasses such as nitrogen oxide and carbon monoxide that are toxic to both humans and the environment (Achawangkul 466). Similarly, petroleum use resulted in the formation of photochemical oxidants, particulate matter, NO_x, and terrestrial acidification. Therefore, neither petroleum nor diesel are environmentally acceptable fuel sources for cremation. The effects of electricity use on CO₂ emissions is harder to quantify, as it depends on how the electricity is produced (Achawangkul 466). A coal-fired plant emits 940 grams of CO₂ per kWh of electricity, (“U.S. Energy”) while nuclear plants emit only 1.4g of CO₂ (Sovacool 1) and solar farms emit 19-47g CO₂ per kWh. Therefore, in areas where electricity is produced through low carbon emitting sources such as solar power, electricity is the most environmentally friendly fuel. However, in locations where electricity is produced by high carbon emitting fossil fuels, biomass is a viable option because if properly regulated, biomass is

carbon neutral and causes no significant damage to ecosystem or human health (Achawangkul 466).

The public should be educated about the benefits burning casket-less bodies, which includes fewer carbon emissions, less fuel use, and saving the cost the casket itself. While 10% of cremations are held in a casket, there is no scientific reason to do so (Goetting). While many may choose to opt out of burning corpses with a casket, religious and cultural reasons may encourage others to retain this practice. In this case, the carbon emissions of burning the casket can still be limited by requiring the corpse be held in a quick-burning casket, such as those made from wicker or cardboard (Goetting). Quick-burning caskets require less fuel use and are therefore responsible for fewer carbon emissions. In addition, the caskets themselves are responsible for fewer emitted greenhouse gasses. Traditional hardwood caskets often come from unsustainable harvesting of tropical hardwoods and are responsible for deforestation. Due to their high weight, transporting traditional caskets is also expensive and fuel-intensive (Lewis 2). By using these alternative wicker and cardboard caskets, especially if they are made from local fast-growing willow and bamboo, consumers can reduce the carbon footprint of their cremations.

The mercury and carbon emissions of cremation can be reduced by removing dental fillings prior to cremation. An individual cremation releases between 2 and 4 grams of mercury from incinerated dental fillings, totaling 3,000 kilograms released into the environment from cremations per year in the United States alone (Reindl 1). In fact, dental amalgam accounts for 8% of all mercury demand in the United States (Pirrone 5957). As 48% of dead Americans are cremated each year, that means that 4% of the mercury purchased each year will eventually be released into the atmosphere (Arenhold-Bindslev 716). Once in the environment, mercury accumulates in wastewater treatment plants as well as in biological communities, particularly

marine systems (Arenhold-Bindslev 714). Once in a natural system, mercury bioaccumulates and poisons upper level predators. Research around the Bournemouth and Lancian Crematoriums in England have discovered an uptick in mercury concentrations around both crematoriums (Wood 69). Unfortunately, as the life expectancy rises, the dead are expected to have more fillings. In 1984, dental fillings per cremation totaled 3.6g, while in 2020 the amount is forecasted to be 5.9 grams (Reindl 9). While this is due in part to the age range of the deceased, increased tooth retention among the elderly is the primary cause. The growing number of fillings among the dead and the composition of dental amalgam is unlikely to change, so the best way to reduce the amount of mercury released into the atmosphere from cremations is to remove dental fillings. These removed teeth can then follow the same process as teeth removed from the living, in which they are sent to a metal recycling plant capable of safely extracting the mercury for the amalgam (Berglund 1).

Simply removing dental fillings offers another advantage: lower-temperature cremations. For mercury to be captured by current emission scrubbers, the cremation must be held at a temperature in which the amalgam vaporizes rather than melts and can then be removed from emissions via scrubbers, rather than solidifying in the cremated remains (Costa 3). Therefore, by removing the dental fillings, cremations can be held at a lower temperature, which lowers fuel use and, as a result, carbon emissions. While removing the dental fillings may be an invasive procedure, it is not without precedent. Implants such as pacemakers, whose battery will explode in the high temperature of cremation and potentially harm both the crematory and crematory operators, are required to be removed before cremation (Gale). By requiring crematory operators to remove teeth with mercury fillings prior to cremation, the government can reduce the mercury and carbon emissions of cremation.

Funeral homes have the option of either throwing away or recycling medical implants that are not vaporized during the cremation process, such as titanium hip implants and artificial knees, but are not required to do so (Rumble 247). While recycling implants does not directly affect the carbon released during cremation, recycling metals reduces the need to mine new resources and therefore indirectly affects the carbon footprint of cremation. In fact, when the entire life cycle of titanium is investigated, each kg of titanium is responsible for 35.7 kgs of CO₂ (Norgate 2). However, when that titanium is recycled, the new product is only responsible for 2.6 kgs of CO₂ (Bentamane 25). By requiring all funeral homes to recycle all titanium medical implants, the carbon cost of cremation can be partially offset.

Recycling the resources of cremation can go beyond medical implants by recycling heat. In order to capture the mercury emitted during the cremation process, emissions are captured and cooled. This capturing method means that rather than escaping through the chimney, the heat of cremation is caught in a cooling system and can potentially be recycled (Rumble 248-249). While this idea may seem outlandish and culturally unacceptable, as much of the heat comes not from the fuel source, but from the body's fat, it's already been used; the Reddich Borough Council recycles heat from their municipal crematorium to warm a public swimming pool (Rumble 248). While the heat recycling system was initially costly, it now meets 42% of the center's heating needs and has saved over \$18,000. In order to stem public outcry, the Redditch Counsel successfully chose to act transparently and proactively address concerns (Rumble 248). While recycling heat into recreational pools require that the pool and the crematorium are nearby, an uncommon situation, recycling heat can be applied to the crematorium itself and any other nearby buildings.

Even with these regulations, cremation is not the most environmentally friendly option of death care; traditional burial, involving an embalmed corpse, hardwood or steel casket, and a concrete vault, is not sustainable either. Each year, 800,000 gallons of formaldehyde-based embalming fluid are buried, alongside 1,000 tons of casket steel, 20,000 tons of concrete burial vaults, and enough wood in coffins to build 40 homes (“Environmental Impact”). The manufacture and transportation of a single steel casket is responsible for 2,000 lbs of CO₂, which is four times the amount released in a cremation (“A Fresh Green”). The cemeteries themselves are crowded and home to a variety of highly manicured non-native species of grasses and flowers whose fertilizer requirements are comparable to a golf course. The massive amounts of acreage consumed by cemeteries at the present is only expected to grow as the Baby Boomers reach old age, so these eutrofied and low-biodiversity funeral plots will continue to encroach on natural systems. Between the deforestation of cemeteries, the indirect costs of their fertilizer use, and the carbon emissions associated with their resource-consumption, traditional burial racks up a much larger carbon footprint than even cremation. Therefore, rather than limiting ourselves to only traditional burial and cremations, the American public should consider the rising practice of green burial.

While the concept of green burial may seem outlandish, our contemporary notion of a “traditional” burial was only established during the Civil War (“US Funeral History”). The art of embalming was introduced by Dr. Thomas Holmes, who was commissioned by the Union Army to embalm corpses of dead officers so that they could be shipped northward to their families for burial (Kelly 2-3). When the Civil War ended and people were likely to die near home where they could be quickly buried, the practice of embalming began to die out. The companies who producing embalming fluid began to fear their markets would run dry and began to advocate for

a professionalization of death care. By the early 1900s the National Funeral Directors Association was formed. Since then, the practice of families caring for their own dead has all but vanished, and the embalming of bodies and burial in commercial cemetery plots has become prevalent (“US Funeral History”). However, in recent years the movement toward green burial threatens to fragment these norms by removing professional embalmers, funeral directors, and casket-makers from death care.

Green burial only requires the fuel of transporting the corpse, does not indirectly emit carbon through the creation of a concrete vault, casket, and headstone and the graves minimally disturb the surrounding environment and require no upkeep. As well, Kristel Worpel pointed out that by turning environmental refuges into green burial sites, the status of the land will change and cannot be claimed by eminent domain for environmentally damaging projects. The only thing holding the public back from green burial is insufficient education about death care options and cultural and religious practice. However, the rise of cremations indicates that the cultural and religious ties that commit individuals to certain death rituals are declining. In 1960, only about 4% of Americans chose to have their remains cremated, while in 2015 the rate was 48% (Sherman 2015). This sudden shift in funerary practices suggests that cremations are preferred for economic and convenience reasons and can therefore be more readily reversed than if cremation was preferred for deep-seated cultural and religious reasons.

In fact, Dr. Ken Worpel asserts that the rise of cremation is intertwined with a similar rise in secularism and suggests that as religious loyalties decline, people search for other meaning (Worpel 1). As people accept that “we are a part of nature, not distinct from it,” Worpel suggests that we will look to nature for inspiration and meaning and as such, infrastructure for disposing of the dead should draw from nature (Worpel 5). Therefore, as secularism rises and

identification with the environment becomes a new source of meaning for the coming generations, education in death care options may be all that is needed to push the population away from traditional burial and cremation, and toward green burial.

However, some critics would remark that cremation and burial practices account for such a small portion of CO₂ emissions that enacting regulations on cremations and encouraging a change in death rituals is unnecessary and morally unjustified. Electricity production was responsible for a whopping 2,061 million tons of CO₂ in 2014, for example, so why not focus our efforts on eliminating fossil fuels from power plants and subsidize wind or solar forms?

While it is true that the disposal of human bodies is not among the largest contributors to climate change, it does not necessarily follow that efforts to reduce the carbon emissions associated with caring for the dead is not a worthwhile venture. The fuel of one cremation can release as much as 573lbs of carbon dioxide into the atmosphere (Briggs 2), which is equivalent to the amount of fuel required to drive nearly 5,000 miles (Miller). While this number may pale in comparison to the carbon emissions of electricity production or industrialized agriculture, it is not insignificant. If we are to mitigate climate change, we must reimagine every aspect of our lives, including our deaths.

The tides of culture are already turning toward green burial. In 2006, only one green cemetery existed in the United States, while now the number has swelled to over 300 (“Find a Provider”). As the public becomes more environmentally conscious, the growth of green burial will only be stemmed by the public’s willingness to discuss and plan for death care. The government can open this conversation on environmentally friendly death practices by educating the public, implementing measures to increase fuel efficiency and limit the carbon output of cremations, and directly advocate for green burial.

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