



## Fact or Fiction?

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# Cremation and the Environment

## Introduction

A fascinating alternative to coffin burial or cremation, dubbed “metallic burial,” is to convert corpses into “statues of gold, silver, and copper by electroplating them for display in ‘domestic galleries.’”<sup>1</sup> Imagine hanging your hat on gold-plated grandpa as you walked into grandma’s house.

Dorothy Sayers, described by the Los Angeles Times as one of the greatest mystery story writers of the twentieth century, used this technique in her story, “The Abominable History of the Man With Copper Fingers.”<sup>2</sup> It’s about a man named Eric Loder who was a metal sculptor specializing in life size replicas. He had a magnificent house in the country crammed with pictures and antiques, was a *bon vivant*, and had a most beautiful live-in, Maria Morano. He was also very jealous and after suspecting that Maria was having an affair with a house visitor used her as a mandrel for an electroforming project! The completed piece became an *objet d’art* in Loder’s front room. As described by Lord Peter when he visited Loder, “There was a great silver figure of a nude woman, fully life-size, lying with her head back and her arms extended along the sides of the couch. A few big loose cushions made it possible to actually sit on the thing, though I must say it never was really comfortable to do this respectfully.” More on the Sayers story can be found in a previous column [“Plating Mysteries: Part 1,” *Plating & Surface Finishing*, **88** (2), 44 (2001)].

Sorry for the digression but I remain fascinated by the thought of electroplating a human body. A real technical challenge! Back to the subject of this month’s coverage - cremation, which presents some interesting environmental issues.

First, some words on conventional burial, which is not as green as it might seem. Dr. Arpad Vass, from Oak Ridge National Laboratory has identified more than 450 different compounds in the gases given off by bodies as they decay.<sup>3</sup> Besides this, in many countries, bodies have to be

embalmed. A corpse buried in a coffin takes 50 to 60 years to decompose, and as it does so, embalming chemicals such as formaldehyde can also pollute the groundwater.<sup>4</sup>

LeeAundra Temescu reports that burials in America deposit 827,060 gallons of embalming fluid - formaldehyde, methanol and ethanol - into the soil each year. I don’t know how she got so precise a figure, but just rounding off to 800,000 gallons indicates a lot of embalming fluid.<sup>5</sup>

Along with our corpses, we also bury huge amounts of concrete, steel, copper and bronze - 1.5 million tons of concrete and 100,000 tons of steel a year in the U.S. alone. Dave Reay notes, “This final testament to your conspicuous consumption can mean an extra ton of emissions.”<sup>6</sup>

Burials also take up lots of land as can be seen from the following calculation from Kenneth Iverson:

- Typical grave plot = 4 ft × 8 ft
- Two million people die in the United States each year
- More than 85% of deaths are followed by in-ground burial.
- (4 ft × 8 ft) × (2 million deaths) × 0.85 = 54,400,000 sq ft = 1,249 acres.

This is approximately two square miles and doesn’t count the land used for space between graves, roadways, crypts and administrative facilities. Iverson reports, “This means that given the same rate of death and burial over the next 230 years, new graves will take up a land area equal to the size of Los Angeles.”<sup>7</sup>

## Cremation

About 25% of all the dead bodies in the United States are cremated. That’s about half a million people. By 2010, the rate is expected to reach nearly 40%. The trend is unevenly spread. Those in the western third of the nation, along with New Englanders, are quick to render themselves to dust. The middle of the country much

prefers the slow underground route. Only 7% of Mississippians opt for cremation.<sup>8</sup>

The Consumer’s Union suggests four reasons why cremation is growing increasingly popular in the United States:

- Cremation usually costs less than interment
- There is a marked decrease of available cemetery space
- Modern cremation methods are clean, quick and efficient and
- There is more religious tolerance, even encouragement of cremation than in the past.<sup>7</sup>

In some places in the world, cremation has resulted in the denuding of forests. Buddhism introduced into China the idea of cremation of the dead, and from the 10<sup>th</sup> to the 14<sup>th</sup> centuries, cremation was common enough in the southeastern coastal provinces to create a timber shortage there.<sup>9</sup> The Hindu system of cremation results in the consumption of over 40 million trees annually, leading to the denudation of 1,500 to 2,000 sq. km. of forests.<sup>10</sup> Where religious considerations are not an issue, modern day crematoria do not present this problem.

## Pollution from crematoria

“In the grand scheme of industrial air pollution, crematoria rank low on the fret list. They emit about half as much particulate matter as a residential fireplace and about as much nitrous oxide as the typical restaurant grill,” observes Mary Roach.<sup>11</sup>

The happy news, for those who wish to hasten their return to dust without fouling the atmosphere, is that cremation produces so little pollution that the EPA has deemed it a low priority for regulation.<sup>12</sup> However, the line between solid waste disposal and funerary rituals must be well maintained. As Roach notes, “Interestingly, this is one of the reasons the EPA doesn’t regulate U.S. crematoria. For if it did regulate them, the rules would be promulgated under Section

129 of the Clean Air Act, which covers 'Solid Waste Incinerators.' And that would mean that what is incinerated at crematoria is 'solid waste.' The EPA does not wish to stand accused of calling America's dead loved ones 'solid waste.'"<sup>13</sup>

But don't be misled into thinking that bodies being cremated are pollution free. Of greatest concern is mercury from dental fillings, which vaporizes and drifts into the atmosphere. Allan Mills estimated the average amount of mercury released into the atmosphere at three grams per cremation.<sup>14</sup> Others report from 0.25 gram<sup>12</sup> to 0.5 gram per cremation.<sup>7</sup> Although the EPA estimates that less than 1% of all mercury emissions come from crematories yearly, states such as Colorado and Minnesota are trying to legislate crematory operators to remove teeth or install filters.<sup>15</sup>

Crematoria in Sweden have been hit with environmental regulations regarding volatilized mercury from fillings, and many need to make costly upgrades to their equipment.<sup>16</sup> David Gabe reports, "The main regular source of mercury pollution in the U.K. is now crematoria (dental amalgam tooth fillings). Consequently all crematoria must now fit reactive fume-filters which cause mercury to form an insoluble precipitate compound which can be electrostatically precipitated and binned for recycling. The cost will add 25 to 35% to the cost of cremations which 'the dead must pay to keep the living living.'" - (David's clever words, not my own).<sup>17</sup>

Mercury isn't the only contaminant from cremations. Burning dead bodies gives off clouds of sulfur dioxide and nitrogen oxides as well as carbon monoxide and carbon dioxide that can irritate the lungs or eyes.<sup>18</sup> Cremation also pumps dioxins and hydrochloric acid into the air.<sup>5</sup>

The Japanese practice of cremating the bodies of deceased persons is found to be a major contributor of dioxin contamination in major cities. Adding to the problem is the practice of placing various mementos, such as golf clubs, plastic dolls and even pacemakers of the deceased person into the coffin, to be cremated together with the body.<sup>19</sup>

Cremation requires some energy. Susanne Wiigh-Masak, a Swedish ecologist, estimates that crematoria use the equivalent of 50 liters of oil to reduce a body to ash.<sup>4</sup> *P&SF*

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