

Embalming Arsenic Leachate Surveys

5th Street Cemetery Necrogeographical Study



Belying their tranquility, cemeteries harbor several contagions. Nineteenth century embalming methods are especially problematic. Undertakers routinely used an arsenic trioxide solution in large doses to control bacteria and postpone putrefaction. Some recipes recommended up to 12 pounds per corpse.¹ However, it killed many practitioners and was banned by 1910. Arsenic sickens by allosteric inhibition. Essential metabolic enzymes are blocked, and the victim suffers multi-system organ failure. Mortician health improved, but the effects of arsenic pollution in old graveyards have only lately received attention.

In June 2008 a high school student team drew soil cores from various depths in areas of the old cemetery flagged by ground-penetrating radar in an effort to reconstruct the substrata's chemical signature. Dissolving the soils with reagents in solution and using the EPA standard acid digestion techniques followed by optical emission spectroscopy supplied by a regional environmental laboratory, the team isolated the key markers. The results demonstrated only background levels of arsenic — about 5 parts per billion, normal for the soils in the region. Given the early burial dates and the lack of local undertakers before the 1880's, arsenic may not have been utilized to an extent that leachates can now be detected, and the groundwater may have long ago lixiviated any possible residue. However, the explorations did not prove fruitless.



Pioneer Park



Normal Hill Cemetery

The arsenic profile of one anomalous find at the 3.0m level tested 29% higher than other sites. The level of zinc was 100 times greater. As the sample surfaced in a deposit too deep for irrigation pipes and was coated with wood fibers, a collapsed zinc-lined coffin seems the most likely source. These coffins became fashionable during the Civil War, when the long-awaited arrival of a corpse from a battlefield could prove singularly unpleasant without a sealed container. In warm weather, they could be filled with ice to preserve a body before burial. The style remains the standard for international shipments of repatriated human remains.

If the old cemetery soils lacked the marker, what about the trees? Has it not been said: "The oak / Shall send his roots abroad, and pierce thy mould."² In September 2008, a junior high school field team extracted tree ring samples from the maturest trees in Normal Hill Cemetery and Pioneer Park. The resulting lab data proved inconclusive. However, cities and towns maintaining wells on or near pioneer cemeteries are advised to have the water tested for arsenic leachates.³



Pioneer Park
[positions of soil cores]

total station position

Image courtesy of Avista Utilities

Investigative teams

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¹ *The ERA Formulary* (Detroit MI: D.O. Haynes & Company, 1893), 321-322.

² William Cullen Bryant, "Thanatopsis," *Yale Book of American Verse* (New Haven CT: Yale University Press, 1912), lines 29-30.

³ John L. Konefes and Michael K. McGee, "Old Cemeteries, Arsenic & Health Safety," *Cultural Resources Management* (National Park Service, IX:10, 1996), 15-18.