

## Mercury on a Galleon

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This mercury from the 1622 *tierra firme* galleon *Nuestra Señora de Atocha* was recovered by Salvors, Inc from the northern end of the wreck site in 2002 and donated to the Mel Fisher Maritime Heritage Society.

The discovery of 50.26 grams (3.71cc) of mercury from the wreckage of the galleon *Nuestra Señora de Atocha* evokes a sense of the scientific practices that prevailed in 1622, especially as they related to mining and medicine. In addition to the small amount of mercury, clumps of mercury amalgam, have been found at the site. Why they would be found on a Spain-bound ship is not entirely clear, and there are at least two competing scenarios:

### Silver Mining

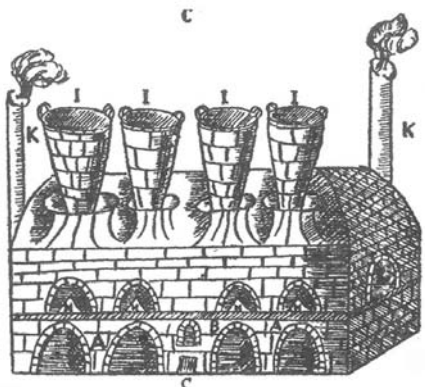
In the early 17<sup>th</sup> century Spanish silver mining was dependent on a process that called for copious amounts of mercury.

This process, which had been exported to the American colonies in the 1550's by a Sevillian cleric named Bartolomé de Medina, and adapted to the large-scale demands of the New World's mining industries, proved to be revolutionary. Medina had been working on ways to improve on metal smelting, when his efforts caught the notice of a helpful German alchemist. This man showed Medina a way of combining mercury with ore to extract pure metals. He told him:

“Grind the ore fine. Steep it in strong brine. Add mercury and mix thoroughly. Repeat mixing daily for several weeks. Every day take a pinch of ore mud and examine the mercury. See? It

is bright and glistening. As time passes, it should darken as silver minerals are decomposed by salt and the silver forms an alloy with mercury. Amalgam is pasty. Wash out the spent ore in water. Retort residual amalgam; mercury is driven off and silver remains.”<sup>1</sup>

When this process was applied to the ores of Mexico and Peru, the efficiency of metal extraction increased by 500% or more. Even low-grade ores and piles of tailings could be processed profitably, and a global economic revolution fueled by American silver began. The *Atocha*, *Santa Margarita*, and ships like them were essential to exporting this wealth across the seas.



A furnace designed to heat mercury-silver amalgam. The mixture was held in copper cauldrons. From Barba's *Arte de los Metales*, 1640.

Mercury has the unusual property of dissolving many metals, especially gold, silver and tin. This makes it especially useful in recovering them from ores by crushing the raw material, and mixing it with mercury and salt until the metals combine into a pasty mixture. The remaining amalgam can be squeezed or heated until the mercury is driven off,

<sup>1</sup> “Bartolomé de Medina: The Patio Process and the 16<sup>th</sup> Century Silver Crisis” by Alan Probert in *Journal of the West*, Vol.8, No.1, January, 1969. A similar process had earlier been outlined in Vannoccio Biringuccio's *La Pirotechnica* of 1540.

leaving the desired precious metal behind. This process is quite ingenious in its simplicity, requiring only copious amounts of mercury, brine, copper sulfide, and labor. The unfortunate aspect of it is the toxicity of mercury, which destroyed the well-being of many who worked with it, and the long-term pollution it leaves behind.



Two small clumps of mercury amalgam recovered from the wreck of the *Atocha* in 1984. They have a granulated texture and are quite soft.

Spain had two large-scale sources of Mercury available to its mining operations – the mines at Almadén in Spain, and Huancavelica in Peru. (Another available, but less accessible source was in Idrija, Slovenia.) The deposits of Almadén account for the largest quantity of liquid mercury metal discovered anywhere in the world. Some 275,000 tons of mercury have been produced there over the past 2,000 years. During the colonial period though, almost all of its output was reserved for the silver mines of Mexico<sup>2</sup>. With the discovery of mercury at Huancavelica in 1566, coinciding very nearly with the introduction of amalgamation at Potosí,

<sup>2</sup> “New Spain's Mining Depression and the Supply of Quicksilver from Peru, 1600-1700.” By M.F. Lang in *The Hispanic American Historical Review*, vol.48, no.4, November, 1968.

this new Peruvian source seemed to be a godsend, and became the chief supplier for South America. The silver mines of the high Andes demanded 5000 *quintales* (275 tons) annually, using nearly all of its output. Huancavélica was only a periodic, secondary supplier for Mexico.<sup>3</sup> Both strict Spanish rules against intercolonial trade, and the inherent difficulties of transporting the very heavy and dangerous liquid, also had a deep effect on this situation.

With the *Atocha* carrying over 30 tons of Potosí silver, and probably all of it refined through amalgamation, mercury was vastly important to the economic mission of the ship.

## Medicine

Some time in the late 1400's a seemingly new and especially virulent malady - syphilis - began to cut across Europe. People weren't sure what it was, or where it had come from. The result of this confusion was cultural name-calling, yielding monikers for the affliction like "the French disease," or "Neapolitan sickness." Debate continues to this day as to whether it originated in the Americas and was brought from there with Columbus, or if it simply mutated from some existing disease.<sup>4</sup>

Mercury was deemed the drug of choice for syphilis, and the first descriptions of its use outline treatments based on the ingestion of mercury-based compounds, or similarly constructed ointments rubbed on the skin. This remedy is likely derived from the earlier, Arabic treatment of scabies with a tincture of mercury, and which had been carried by returning crusaders as a

<sup>3</sup> *ibid.*

<sup>4</sup> "Origins of Syphilis" by Mark Rose in *Archaeology* V.50 No. 1, January/February 1997

treatment for leprosy.<sup>5</sup> The lesions produced on the genitals and body in the early stages of syphilis must have appeared similar to the skin disorder, and the logic of the day simply transferred the treatment of one to the other. Mercury has also been considered a remedy for gonorrhea and other infections, constipation, depression, toothaches, among a host of other ailments.<sup>6</sup> Medicinal mercury was also administered by mouth and injection, and the metal and its derivatives thrived in various medical applications for nearly four centuries.<sup>7</sup>

Et Balafrañcos morbo galloꝝ  
preferuatio ac Cura a Bartholo-  
meo Stieber Viennensi artium  
medicæ doctore nuper edita.



A Viennese woodcut from 1498 shows syphilitics being treated by both an ointment and liquid in a vial. The patients' bodies are covered with the skin lesions characteristic of the 2<sup>nd</sup> stage of the disease.

<sup>5</sup> *ibid.*

<sup>6</sup> [http://news.nationalgeographic.com/news/2001/07/0717\\_lincoln.html](http://news.nationalgeographic.com/news/2001/07/0717_lincoln.html)

<sup>7</sup> "The Great Pox that was...syphilis," by A.M. Sefton in *Journal of Applied Microbiology* 2001, No. 91. Until 1998 "mercurochrome," which was a solution of mercury, was sold as a topical antiseptic in the U.S., and mercury amalgam dental fillings are still in use.

Mercury poisoning is a distinct hazard of such treatment, and the toxic effects actually served as a gauge for doctors in adjusting dosage. Salivation is an effect of excessive mercury exposure, and this in particular was considered a sign of effective treatment. It was thought that the expulsion of bad “humors” would remove the disease from the body.<sup>8</sup> Sore teeth, swollen gums and ulcers in the mouth were also indicators that enough of the metal had been administered. Too often, the effects went beyond these early warning signs, and tremors, hair loss, and mental impairment began to show. Permanent organ damage, or even death, sometimes occurred.

Syphilis does have a spontaneous resolution rate of approximately 30%, and doctors would often give this as “proof” of an effective treatment. Given all the dubious characteristics though, it should be noted that mercury could actually work as intended, at least in the earlier stages of infection. By the late stage of syphilis mercury has no effect.<sup>9</sup> There have been no formal studies too explain the mechanism of any efficacy.

Because its use was so ingrained in the medical thinking of the day, there is little doubt that mercury, or compounds containing mercury, would have very likely been a part of the *Atocha's* medicine chest. Of the ships' Barber-Surgeon, it was advised, “*He is to carry the proper trappings for his office, and some drugs or medicines for when the need occurs.*”<sup>10</sup> Some of the “proper

trappings” specifically devised to administer mercury compounds have been found on other shipwrecks, including a pewter urethral syringe found on the 1545 shipwreck of the English *Mary Rose*.<sup>11</sup> A similar syringe was recovered from the wreck of what is thought to be the pirate Blackbeard's *Queen Anne's Revenge*, which sank in 1719. This syringe was found to have very high levels of mercury within its chamber<sup>12</sup>. Somewhat larger bronze syringe needles have been found on the *Santa Margarita*, and are thought to have originated from enema devices, and which could have delivered mercury or its compounds via that avenue.

## Conclusions

Unalloyed, metallic mercury has been found on other colonial-era shipwrecks, most-notably the *Conde de Tolosa* and *Nuestra Señora de Guadalupe*, which were vessels specifically built to carry mercury from Spain to the Americas in leather-lined boxes. They were on a voyage doing just that when they were lost near Hispaniola in 1724.<sup>13</sup> Other sites, such as the Emanuel Point Shipwreck, thought to be from Tristan de Luna's unsuccessful attempt to colonize northwest Florida in 1559, and the Angra D site, an unidentified Iberian vessel from the turn of the 17<sup>th</sup> century,

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<sup>8</sup> “Bacteriology at UW Madison: Syphilis” by Wendy Dingell at:

<http://www.bact.wisc.edu/Bact330/syphilis.html>

<sup>9</sup> “Poems, Paintings and Penile Chancres,” by Tony Worthington, in *Microbiologist*, December, 2004.

<sup>10</sup> *Instruccion Nautica* by Diego Garcia de Palacio, Mexico City, 1587. Translated by J. Bankston, 1986.

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<sup>11</sup> *The Mary Rose* by Margaret Rule, Conway Maritime Press, London 1982.

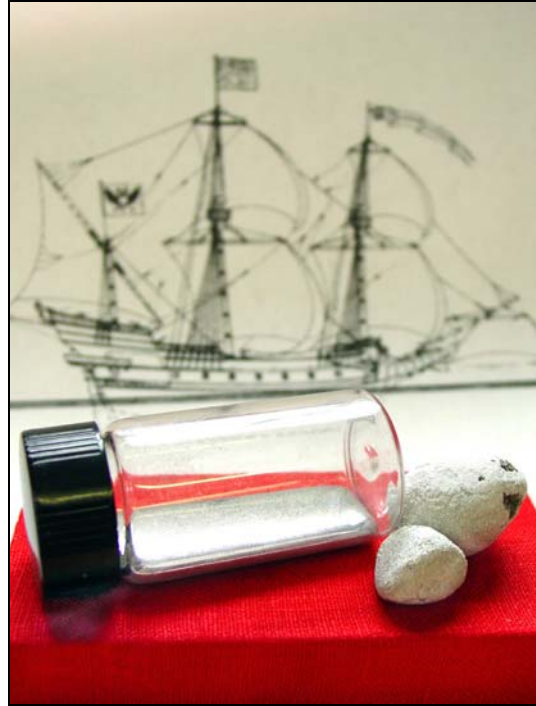
<sup>12</sup> “Preliminary Studies of Some Base and Precious Metals from the Queen Anne's Revenge,” by James R. Craig, et al. in *Southeastern Geology*, Vol.40, No.1, February 2001.

<sup>13</sup> “Treasure Ships of the Spanish Main: The Iberian-American Empires,” by Roger C. Smith in *Ships and Shipwrecks of the Americas*, George F. Bass, editor. Thames and Hudson, New York, 1988.

also carried mercury.<sup>14 15</sup> These ships revealed only small amounts of the liquid metal, and no absolute indication of its intended purpose. Certainly, though, such an abundance of archaeological evidence covering over two centuries and a number of cultures reflects the importance of mercury in colonial life.

In looking at the chief uses of mercury in the early 17<sup>th</sup> century, is there a clear reason as to why it was carried on the *Atocha*? The story of the 1622 fleet is one that is driven by silver coming from Potosí in colonial Peru – the core objective of these ships was to transport this valuable metal across the Atlantic – so, perhaps materials relating to the production of it should not be unexpected. The importance that was placed on the medicinal use of mercury also makes it likely that it served as drug in and of itself, or was available as an ingredient for various compounds and mixtures.

Ultimately, no side of this line of reasoning is stronger than the other. Mercury was used for a number of purposes in the early 17<sup>th</sup> century, and this examination of the subject has only looked at the most likely uses. But earlier peoples' ideas and intentions often have a way of confounding our limited notions. Without definitive context, such as historical documentation or a known type of container, this discovery may simply a good example of the concept that even with the evidence in hand; one does not always know exactly what it means.



Mercury clearly had a role on Spanish colonial ships, but what was it?

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<sup>14</sup> *The Emanuel Point Ship Archaeological Investigations 1992-1995*, by Roger C. Smith et al., Florida Dept. of State, Tallahassee, 1995.

<sup>15</sup> <http://nautarch.tamu.edu/SHIPLAB/angra09-angrad.htm>