Origins of the American Chemical Enterprise

Jamestown

October 10, 2007

A National Historic Chemical Landmark

American Chemical Society

SCIENCE THAT MATTERS

Jamestown

Jamestown revisited

It is difficult to separate the history of Jamestown from the myths obscuring the first successful English settlement in the Americas. The most enduring story surrounds Pocahontas saving the life of Captain John Smith. For many years scholarship supported many of the myths, the most important of which held that the early settlers sought only gold and other riches and were ill-prepared to survive in the new environment.

Evidence from recently unearthed archaeological excavations challenges old assumptions. This evidence disputes the view that the Jamestown colony failed due to a high mortality rate resulting from the laziness and ineptitude of the settlers. Instead, archaeology paints a more complex picture of the first permanent settlement of English-speaking people in the Americas.

An indication of this complexity—and of the intended permanence of the Jamestown settlement—is the discovery at James Fort of chemical tools and apparatuses to detect, identify, and process natural resources for commercial uses. From the beginning of settlement, the colonists applied European technologies to indigenous raw materials in metallurgy, pharmacology, and perfumery. All of this points to early Virginia as the birthplace of the American chemical enterprise.

Chemistry at Jamestown

The archaeological record at Jamestown refers to many chemical practitioners, including the apothecary, barber surgeon, physician, alchemist or metallurgist, and other metal-related trades such as refiners, goldsmiths, and blacksmiths. Also present were artisans skilled in glass manufacture.

Artifacts of apothecaries reveal vigorous experimentation with Virginia *flora*. As devoted Paracelsians, who advocated use of chemical drugs, early Jamestown medical practitioners naturally investigated local plants. Numerous drug jars, of Dutch or English origin, demonstrate the work of apothecaries. Further, a medical tool for relieving constipation due to impacted fecal matter, a *spatula mundani*, has been recovered. This instrument is known to have been provided in a surgeon's chest prepared by John Woodall, a Paracelsian physician who later became surgeon-general to the East India Company. Woodall's medicines and treatments make extensive reference to the *tria prima* of Paracelsus, salt, mercury, and sulfur. Woodall's medical treatments and medicines may also be reflected in other early Jamestown finds, a cranium bearing the mark of a trepanning tool (the cranial piece having been removed during a *postmortem* examination), and a piece of sulfur.

The evidence of perfumery at Jamestown links with medical and apothecary pursuits. Perfumer Robert Alberton produced scented preparations. An earthenware fuming pot has been discovered which might have used a burning substance—obtained from a perfumer—to fumigate for medical purposes. In fact, the advancement of perfumery using New World resources was a priority in an exploratory voyage to the Chesapeake Bay before the founding of Jamestown. Samuel Mace's 1602 voyage to Virginia searched for the Lost Colonists of Roanoke and for plants, seeds, and bark of *flora* identified during a previous voyage as useful for perfumery and apothecary.

By 1608, the first glass factory, employing Germans and Poles, had been established in the New World at Jamestown. Archaeological investigations have found the locations of glass furnaces showing the technology utilized. Colonists used silica, lime, and soda, or potash substituted for soda, materials known at the time as "salts." Jamestown's sand was rich in metallic oxides with high lime content. Old glass, or cullet, fragments of which are abundant at Jamestown, were also an ingredient.

Jamestown's metallurgy, however, reveals the most tantalizing evidence of early chemical practice. In the summer of 1607, Sir Walter Cope wrote to Robert Cecil, the Earl of Salisbury, explaining the promises of the New World and the treasures of Virginia. "Instead of milk we find pearl and gold instead of honey." Cope's writings were influenced by a metallurgist named Beale, "an excellent trier [sic] of minerals," who had identified a precious supply of "dirt" that was sure to yield a large percentage of gold.

A sample of the dirt was sent to England with Captain Christopher Newport in June 1607—just a month after the settlers first arrived—to be analyzed by London's assayers, but Beale's precious dirt disappointingly lacked any sign of gold. During testing "all turned to vapor."

Exploring for and testing possible gold ores in Virginia had an all too familiar outcome that rings throughout the records of Jamestown's first two years. Accounts by men such as Cope frequently speak of gold mines, but none of the alleged sources are known to have yielded treasures. As a result of such records modern historians have

tended to form biased views of Jamestown and the historiography of the colonizing effort commonly refers to lazy and unproductive settlers who carried out little more in Virginia than a "reckless search for gold."

Financial gain was, of course, the primary goal of the Virginia Company of London, the corporate organization responsible for the settlement of Jamestown. Along with a desire to find a Northwest Passage to the Pacific Ocean for trading purposes, the company sponsors hoped to profit by exploiting the natural resources of Virginia. Although they expected to find precious metals such as gold and silver, recent historical and archaeological scholarship reveal how the Virginia Company equally sought to discover sources of more utilitarian materials, such as ores required at home for the production of brass. The search for metals, in fact, was a priority at Jamestown. Colonists intended to establish a trading center, and they were "not permitted to manure or till any ground" but instead were required to invest labor in profitable activities. In fact, letters patent to the colony leaders specified "to dig mine and search for all manner of mines of gold silver and copper."

Copper

The archaeological excavations of James Fort, carried out by the *Jamestown Rediscovery Project*, have recovered a wealth of artifacts related to the colony's metallurgical endeavors. Crucibles, cupels, scorifiers, alembics, slag, and melted metal indicate that a host of metals and minerals were processed, refined, or tested at Jamestown during the colony's earliest years. Of Jamestown's metalworking remains, evidence for copper-based metallurgy is particularly strong. Numerous triangular and beaker shaped crucibles have been excavated, and several examples contain copper residue. Further indications of copper-related activities at Jamestown come in the form of melted copper masses, including one uniquely shaped piece that fits perfectly into the bottom of a triangular Hessian crucible. The connection between these artifacts, along with the crucibles containing interior copper residue, exemplifies how working or testing copper took place at Jamestown, and how metallurgical activities other than those strictly associated with the search for gold occurred within the settlement.

Additional artifacts recovered from James Fort that offer details of Jamestown's non-ferrous metallurgy include over 8,000 pieces of sheet copper. Taking the form of small scraps and trimmings, these finds have been interpreted as off-cuts related to the production of goods used for trade with the local Powhatan Indians. The Native American populations of eastern North America during the early 17th century desired copper, and the settlers of Jamestown recorded frequent exchanges of copper for foodstuffs. On one occasion John Smith noted that the Virginia Native Americans were "covetous of copper" and "offered pieces of bread and small handfuls of beans or wheat for a hatchet or a piece of copper."

No doubt some of Jamestown's scrap copper was traded with Native Americans. However, when examined scientifically alongside Jamestown's non-ferrous metallurgical debris, it becomes apparent that much of Jamestown's scrap copper can more accurately be explained as manufacturing waste that was supplied by English copper industries as an ingredient to assess New World mineral ores for their use in the formulation of brass, another indication that one of the goals of the Jamestown settlement was to meld European technology with local resources to produce products for home use.

Conclusion

The crucibles and melted copper waste excavated from James Fort clearly illustrate that metallurgical experiments involving copper were performed. The archaeological evidence for copper-related metallurgical operations at Jamestown indicates that the English carried out a search for zinc resources in the New World. The scrap copper supplied by the English copper monopolies was used in a metallurgical capacity, probably in attempts to identify zinc ores for the production of brass. While Jamestown's metallurgists were unsuccessful in discovering and extracting the minerals necessary for the production of brass and while copper-based industrial pursuits earned little for the Virginia Company, these labors provide evidence of English colonial and early American chemical enterprise. Taken as a whole with other chemical endeavors, the English were vigorous in establishing several pursuits with varying degrees of success.

The artifacts require us to scrutinize the make-up of the colonists, particularly the specialists and their sponsors. About a quarter of the people who entered Jamestown during its first year had an association with the working of metal. German involvement with English merchant voyages dates to a half century before Jamestown, when German investors agreed to finance English mining. We see a pattern of intense chemical experimentation for the metallurgist especially; with chemical apparatus both imported and manufactured on site, under direction of both English and German experts.

Jamestown's artifacts tell a story of industrial research and development aimed at fusing English and Virginia natural resources into products for European consumption. The English sought native Virginia commodities, from metals to *flora*, with great interest. The application of native resources to European chemical technologies aimed at finding economic sustainability for the English presence in North America. Archaeological excavations indicate a pattern of intense chemical experimentation for the apothecary and the metallurgist and early industrial production of glass.

National Historic Chemical Landmark

The American Chemical Society designated the establishment of the American chemical enterprise at Historic Jamestowne as a National Historic Chemical Landmark on October 10, 2007. The text of the commemorative plaque reads:

English colonists of the Virginia Company of London began chemical technologies soon after establishing Jamestown in May 1607. Working in collaboration with German, Polish, and Swiss specialists, they sought local resources for metals and for the production of substances such as glass, pitch, tar, potash, perfume, and medicine. Following earlier investigations at Roanoke Colony conducted by Thomas Hariot, the Jamestown colonists tested American plants, minerals, and metallic ores to locate, extract, and process substances of commercial value. These efforts founded the American chemical enterprise.

About the National Historic Chemical Landmarks Program

The American Chemical Society, the world's largest scientific society with more than 160,000 members, has designated landmarks in the history of chemistry for more than a decade. The process begins at the local level. Members identify milestones in their cities or regions, document their importance, and nominate them for landmark designation. An international committee of chemists, chemical engineers, museum curators, and historians evaluates each nomination. For more information, please call the Office of Communications at 202-872-6274 or 800-227-5558, e-mail us at nhclp@acs.org, or visit our web site: www.chemistry.org/landmarks.

A nonprofit organization, the American Chemical Society publishes scientific journals and databases, convenes major research conferences, and provides educational, science policy, and career programs in chemistry. Its main offices are in Washington, DC, and Columbus, Ohio.

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Adapted by Judah Ginsberg from an essay by Carter C. Hudgins and Robert D. Hicks. The full text of the essay can be found at www.chemistry.org/landmarks.

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