

Historic Bottles Offer Collaborative Opportunities

The clear glass bottle contained a few drops of yellow, oily liquid. And “SPERM” was the only legible word on the side.

As part of a 10-year collaboration between an archaeologist and a chemist, Lilian Bodley, a University of Idaho junior, tested the yellow residue and concluded the bottle, which was from an archeological excavation in Fort Benton, Montana, originally contained sperm whale sewing machine oil.

For Bodley, learning how to identify chemical residues from historic artifacts is about solving mysteries. To prepare for a career in crime scene investigation, she switched majors, biology to chemistry, as a freshman. Chemist [Ray von Wandruszka](#), who signed her transfer papers, told her about his lab’s work analyzing artifacts.

“I came back a week later and asked to have a look around the lab,” the 20-year-old from Caldwell said. “Ray said I could look around or I could start working on the project the next week.”

Bodley is one of approximately 25 students who von Wandruszka has mentored while working with archaeologist [Mark Warner](#). Von Wandruszka’s students test artifacts from Warner’s excavations and numerous other archaeological sites and museum collections across North America. This service provides archaeologists the opportunity to delve further into the background of artifacts than time and resources generally allow.



Artifacts exposed during the Sandpoint archaeology project excavations of 2008.



Professor Ray von Wandruszka and junior Lilian Bodley run a test for lithium on an atomic absorption spectrometer.

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Analyzing the Past

In 2007, Warner, professor in the Department of Sociology and Anthropology, was the principal investigator on a large archaeology excavation to recover aspects of Sandpoint's early history. His team unearthed more than 600,000 artifacts, including discarded 100-year-old glass bottles. Wanting to identify the bottles' remaining contents, Warner reached out to von Wandruszka, chair of the Department of Chemistry. Von Wandruszka's laboratory found the bottles contained products like medicine, food and cleaning supplies.

The students try to predict what the substance might be and do analyses to test their hypotheses with every artifact, von Wandruszka said. The practice teaches them how to design their investigations and run the instruments used in the investigations, a bonus for Bodley since many of the instruments can also be found in crime labs. In the end, archaeologists are provided with the most likely identity of the substances.

"Archaeologists love us, because, if you want something analyzed, regular labs can never tell you what is in a bottle. They will only look for what you ask them to look for – lead, iron, whatever," von Wandruszka said. "There is no one I know like us — a group you can take a sample to and ask, 'What is this?'"



Professor Ray von Wandruszka and junior Lilian Bodley examine a bottle from an archaeological excavation.

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I’m understanding the past through material culture while Ray is training up the next generation of analytical chemists.

— Mark Warner, professor in the Department of Sociology and Anthropology

Von Wandruszka has his students generate laboratory reports on each of the artifacts. Alongside the analyses and conclusions, the students include historically relevant information like pictures of old advertisements or bottle labels.

Once archaeologists receive the students' reports, they fold the students' findings into their excavation reports and research articles. For example, a number of von Wandruszka's undergraduates are listed in the publicly available report from the excavation of artist James Castle's studio in Boise. Warner's students also include the chemical analyses in their dissertations and theses.

"The whole experience — the lab work, the reports and even presenting at conferences — has really helped raise my confidence in my school work, in doing lab work and my work in science," Bodley said.

Message in a Bottle

During excavations, archaeologists usually recover broken items such as ceramic and bottle fragments or stone tools. However, when they do find items that are unbroken or call for specialized study, archaeologists turn to experts like von Wandruszka.

"In a perfect world you'd pursue every lead, but you usually don't have the resources or the time," Warner said. "In many instances those distinct items get stored without being completely analyzed. Our project provides an opportunity for me and other archaeologists to go back and do more research on some of those older archaeological collections."

Because Warner's projects couldn't provide enough samples to keep up with the chemistry students' appetites, Warner found fellow members of the Society for Historical Archaeology, an international scholarly society for archaeologists, who were interested in providing samples.

Artifacts started arriving in von Wandruszka's Moscow office from historical sites like a brothel in Pensacola, Florida; an old Chinatown in San Jose, California; and an apothecary in Albany, New York. He and Warner have also received items from collections such as a pharmacy museum in New Orleans, Louisiana, and a hospital collection from Providence, Rhode Island. Most of the items were originally discarded in the 19th or early 20th century.

Although bottles make up the majority of the artifacts sent to Warner and von Wandruszka, the pair have investigated tooth fillings, tin cans, fabric, coins and gun powder as well. One Chinese coin from an Oregon excavation arrived coated in a dark brown substance. Von Wandruszka's lab discovered the substance likely contained human cells and deduced the object had probably been used for coining, a Chinese medicinal practice in which a coin is scraped across the skin hard enough to raise welts.

For Warner, findings from the chemical analyses sometimes force him to ask new questions about people's behavior. For example, in Castle's studio, they uncovered Mason jar lids recycled as paint holders and 10 wadded-up pieces of cloth used by Castle to create his artwork.

"This information is really useful to us. What possesses a person to reuse a thing in a new way and dramatically differently than its intended purpose?" Warner said. "Was this a product of isolation, a product of thriftiness? That is intriguing from an archaeological perspective."

Despite the repetitive nature of testing multiple jar lids and pieces of cloth for the chemistry students, Warner said confirming their findings allows him to be more confident in his conclusions.

For their work together, U of I awarded Warner, who is from the [College of Letters, Arts and Social Sciences](#), and von Wandruszka, who is from the [College of Science](#), the [Excellence in Collaborative and Interdisciplinary Research Award](#) in 2018.

"I'm understanding the past through material culture while Ray is training up the next generation of analytical chemists," Warner said. "It's a really interdisciplinary collaboration."

*Article by Leigh Cooper, University Communications and Marketing
Published Date: Published in August 2018.*



Chemistry Professor Ray von Wandruszka and Sociology and Anthropology Professor Mark Warner examine a bottle from an archaeological excavation.