



ASM
INTERNATIONAL

INTERNATIONAL

Brandywine Valley
Chapter

January Virtual Technical Meeting

Tuesday – January 10, 2023 @ 6.45 PM

Restoration of Musical Organs: Analysis of Rubber Cloth and Other Historical Materials

By Undergrad Student: Matthew T. Valderrama

Department of Materials Science and Engineering at the University of Tennessee in Knoxville

Locations: Virtual

- **Virtual meeting with Zoom:**
<https://us02web.zoom.us/j/84967693314?pwd=anR3eUx0aVlnREl2SGIPTU1Gcmp0UT09>

Please sign up for the meeting:

https://docs.google.com/forms/d/e/1FAIpQLScVAIDJ1ZZFn3ZjBOIakYdWSb1PvEKdlck_qPrx31ILWDsA_w/viewform

Abstract: Understanding the relationship between functionality and processing of historical materials is essential in the conservation of cultural artifacts. The lack of well-documented manufacturing techniques during the Second Industrial Revolution creates difficulties replicating modern equivalents of materials or selecting replacements when repairing musical organs. This lack of documentation has contributed to the decline of the cultural, economic, and environmental viability of repairing musical organs. In this work, materials from a century old musical organ were characterized and compared to their modern equivalents through literature review, professional consultation, and materials testing. Structural differences between original and replacement rubber cloths used in the bellows were investigated with electron microscopy. Energy Dispersive Spectroscopy (EDS) and Fourier-Transform Infrared Spectroscopy (FTIR) were used to chemically identify the modern and historical rubber cloth and adhesives. The mechanical properties of the rubber cloths were measured using a permeability chamber. Comparing the analyses of modern and historical materials provides an understanding of the mechanisms responsible for failure. Such an understanding allows for a more informed restoration process such that modern materials and procedures are respectfully substituted in place of their historical counterparts.



Bio: Matthew T. Valderrama, Charlotte Buchanan, Max Camp, and Christopher D. Webb performed this work during their junior year in the Department of Materials Science and Engineering at the University of Tennessee in Knoxville as part of an undergraduate research project. For this work, the team received first-place in the Tickle College of Engineering research category at the UT EURēCA poster exhibition (April, 2022). Additionally, the team was recognized by the ASM Materials Education Foundation with second-place in the Undergraduate Design Competition (September, 2022). The team was honored to have Dr. David Keffer as the faculty advisor.

Brandywine Valley Chapter is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting

<https://us02web.zoom.us/j/84967693314?pwd=anR3eUx0aVlnREl2SGlPTU1Gcmp0UT09>

Meeting ID: 849 6769 3314

Passcode: 270095

One tap mobile

+19292056099,,84967693314#,,,,*270095# US (New York)

+13017158592,,84967693314#,,,,*270095# US (Washington DC)

Dial by your location

+1 929 205 6099 US (New York)

+1 301 715 8592 US (Washington DC)

+1 312 626 6799 US (Chicago)

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

+1 669 900 6833 US (San Jose)

Meeting ID: 849 6769 3314

Passcode: 270095

Find your local number: <https://us02web.zoom.us/u/kdSxi2OA8c>