CHSC 9A – Materials & Methods in Archaeological Chemistry  
Instructor – Dr. Andrew Koh  
Brandeis University – Fall 2015  
T,Th 3:30-4:50 PM (Block P, 317 Goldsmith Math)

Contact Information and Office Hours (Please attend office hours for in-depth questions)  
Koh (akoh@brandeis.edu, 206 Mandel Center for the Humanities): T,Th 11:00 AM-12:00 PM, or by appointment  
Harris (melanieh@brandeis.edu, 125 Edison-Lecks): T 1:30-3:30 PM

Course Description
Does NOT meet requirements for the major in chemistry but does meet requirements for the major in Classical Studies. An introduction to the application of scientific methods for the analysis of material culture including ceramic materials, painting, metal, and stone. Methods include gas and liquid chromatography, optical and SEM microscopy, X-ray fluorescence, and infrared spectroscopy. Laboratory sessions will provide hands-on experience with these methods and exposure to a variety of materials, including objects from the Brandeis Classical Artifact Research Collection (CLARC) and the Brandeis-Concord archaeological field school at McGrath Farm. If enough interest exists, a separate section for graduate students will meet each week for one hour.

Learning Goals
The primary goals of this lab-based course are for students to gain familiarity with the major categories of material culture and the scientific methods used to analyze them. The course will utilize both curated objects from CLARC and freshly excavated objects from McGrath Farm to understand the diverse challenges and gain the necessary skills related to the study and conservation of material culture from various backgrounds. Students will be expected to conduct independent analyses and background research on objects from both collections. A basic knowledge of chemistry and prior course work in art & archaeology are recommended.

Required Textbooks
T. Douglas Price and James H. Burton, An Introduction to Archaeological Chemistry (Springer, 2012)  
E. B. Banning, The Archaeologist’s Laboratory (Springer, 2000)

Secondary Textbooks (on reserve in library)
Maria Perla Colombini and Francesca Modugno, Organic Mass Spectrometry in Art and Archaeology (Wiley, 2009)  
Joseph B. Lambert, Traces of the Past: Unraveling the Secrets of Archaeology through Chemistry (Perseus, 1997)  

Course Website *
http://www.brandeis.edu/latte/*

Please check regularly for announcements, supplementary reading assignments, and lecture slides.

Policies and Expectations
The genuine success of this class depends on sincere, informed participation by its individual members. Therefore, your individual success in this class (as it is measured by a final grade) will depend largely on your attendance, participation, and preparation. Absences will make it much more difficult for you to understand the material presented in the readings and the slides presented in class. Conversely, you cannot engage yourself with the class effectively if you have not carefully read the assigned material throughout the semester. Lectures, labs, discussions, and readings go hand in hand and a solid knowledge of all four is needed to succeed. Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).

*If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately.*

**Enrollment in this course signifies that participants will adhere to Brandeis University policies, including, but not limited to, those set forth in the latest Rights and Responsibilities handbook - http://www.brandeis.edu/studentaffairs/srcs/rr/index.html.**

Class Assessment
Grades will be determined according to the following formula:

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<thead>
<tr>
<th>Percentage</th>
<th>Description</th>
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<tr>
<td>20%</td>
<td>Participation (based on attendance, participation, and technique in class and on LATTE)</td>
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<tr>
<td>10%</td>
<td>Two Case Study Presentations (5% each – one during each unit)</td>
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<tr>
<td>20%</td>
<td>Two Laboratory Exercises (10% each – CLARC and McGrath Farm objects)</td>
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<tr>
<td>10%</td>
<td>Research Paper Proposal (1-2 pages, 1” margins, double-spaced)</td>
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<td>10%</td>
<td>PowerPoint Research Presentation (5-10 minutes for undergraduates, 10-15 minutes for grad students)</td>
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<tr>
<td>30%</td>
<td>Research Paper (1” margins, double-spaced, 10-15 pages for undergraduates, 15-20 for grad students)</td>
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TENTATIVE SCHEDULE
(required readings in **bold**, lecture slides and supplementary readings will be posted on LATTE)

INTRODUCTION

Week 1  
(8/27 & 9/1)  
Welcome and Introduction to Class, Why analyze material culture using scientific methods?  
**Price and Burton: Preface and Ch. 1; Banning: Preface and Ch. 1; Lambert: Preface**  
(*finish readings by end of week*)

Week 2  
(9/3 & 9/8)  
What is material culture? (elements, compounds, minerals, alloys, etc.)  
**Price and Burton: Ch. 2-3; De Atley & Bishop (Toward an integrated interface for archaeology and archaeometry); Killick & Young (Archaeology and archaeometry: from casual dating to a meaningful relationship?)**

Week 3  
(9/17 & 9/22)  
How do we scientifically study and analyze material culture? (chromatography, microscopy, X-ray fluorescence, spectroscopy, etc.)  
**Price and Burton: Ch. 4; Jones (Archaeometry and Materiality: Materials-Based Analysis in Theory and Practice); Kingery (The Contribution of Materials Science to Material Culture Studies)**

UNIT 1: CLARC Objects

Weeks 4 & 5  
(9/24, 10/1, 10/6, 10/8)  
Data and Classification of Material Culture; Paleoclimate; Dating Methods  
**Price and Burton: Ch. 5; Banning: Ch. 2-7, 15-16; Drake 2012; White &Mattingly 2006; Taylor 2000; Manning and Kromer 2012**

Weeks 6 & 7  
(10/13, 10/15, 10/20, 10/22)  
Soils, Stones, and Ceramics; Optical Microscopy and SEM; FTIR  
**Price and Burton: Ch. 6-7; Banning: Ch. 8-9, 12-14; Lambert: Ch. 1-3; Tite 1999 (Pottery production, distribution, and consumption- the contribution of the physical sciences); Tykot 2003 (Determining the source of lithic artifacts and reconstructing trade in the ancient world); Killick (Optical and electron microscopy in material culture studies); Crandall, Koh, and Newman**

**CLARC Object Laboratory Exercise due on October 29**

UNIT 2: McGrath Farm Objects

Weeks 8 & 9  
(10/27, 10/29, 11/3, 11/5)  
Metals and Alloys; Glass; Pigments and Dyes; X-Ray Fluorescence  
**Price and Burton: Ch. 7-9; Lambert: Ch. 4-5, 7; Liritzis and Zacharias 2011; Koh et al. 2015; Georgiou, Koh, and Newman; http://www.xrf.guru/**

**Research Paper Proposal due on November 10** (hardcopy in class, softcopy uploaded to LATTE)

Weeks 10 & 11  
(11/10, 11/12, 11/17, 11/19)  
Plants and Animals; Ancient DNA and Organic Residue Analysis; GC-MS; UPLC-MS  
**Banning: Ch. 10-11; Lambert: Ch. 6, 8; Zohary (Domestication of the Neolithic Near Eastern crop assemblage); Holloway (Excavation and recovery of botanical materials from archaeological sites); Baker, Shaffer, & Steele (Basic approaches in archaeological faunal analysis); Foley, Hansson, Kourkoumelis, Theodoulou (Aspects of Ancient Greek Trade Re-evaluated with Amphora DNA Evidence); Koh, Yasur-Landa, Cline (Characterizing a Middle Bronze Palatial Wine Cellar from Tel Kabri, Israel); Koh (Organic Residue Analysis)**

**McGrath Farm Object Laboratory Exercise due on November 24**

Weeks 12 & 13  
(11/24, 12/1, 12/3, 12/8)  
Class PowerPoint Research Presentations

**Final Research Paper due on December 17** (hardcopy in mailbox by 5 PM, softcopy uploaded to LATTE)