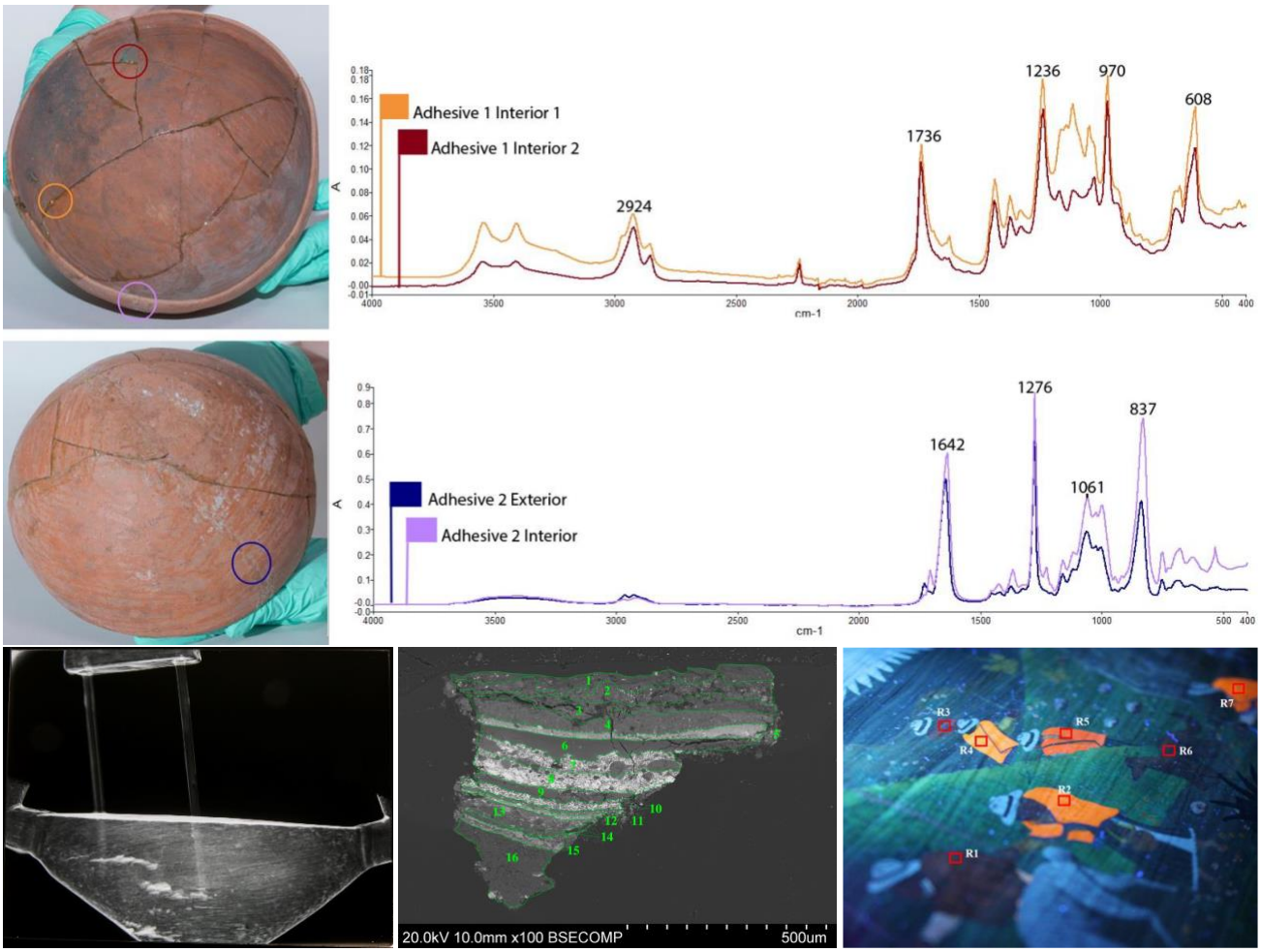
ARCL0106: Conservation Materials Science
Module handbook
2023-24, Terms 1 & 2



Above top row: UC66076 (PMEA) and FTIR spectra from sampled adhesives
Above bottom row: X-ray of Egyptian painted wooden boat; SEM image of layered paint sample from Chinese dance mask, UV image of Ecuadoran painting with sample sites identified

ARCL0106: Conservation Materials Science

2023-24, Terms 1-2

MSc core module
30 credits

Co-ordinator: *Dr. Caitlin R. O'Grady*
caitlin.r.ogrady@ucl.ac.uk
IoA Rm. 203 / 02076797487 / internal 257487
Office hours: Wednesdays 12.00 – 13.00
Thursdays 11.00-14.00 or via appointment
Book time with O'Grady, Caitlin: Office hours

Post-graduate teaching assistant: *Archontoula (Dia) Barouda*
archontoula.barouda.20@ucl.ac.uk
IoA Rm. B11

IMPORTANT INFORMATION REGARDING ASSESSMENTS:

The **coursework coversheet** is available on the course Moodle pages and here: https://www.ucl.ac.uk/archaeology/current-students under "Policies, Forms and Guidelines".

Please enter **your five-digit candidate code on the coversheet and *in the subject line*** when you upload your work in Moodle.

Please use **your five-digit candidate code as the name of the file** you submit.

Please refer to:
https://www.ucl.ac.uk/archaeology/current-students/ioa-student-handbook/13-information-assessment
https://www.ucl.ac.uk/archaeology/current-students/ioa-study-skills-guide/referencing-effectively-and-ioa-guidelines
https://www.ucl.ac.uk/students/exams-and-assessments/academic-integrity
https://library-guides.ucl.ac.uk/referencing-plagiarism/acknowledging-AI

for instructions on coursework submission, IoA referencing guidelines and marking criteria, as well as UCL policies on penalties for late submission, over-length work, the use of text generation software (AI) and academic misconduct.

1. MODULE OVERVIEW

ARCL0106 SHORT DESCRIPTION

This module provides students with an understanding of material chemistry, properties, and structure, as interpreted through the lens of culture. Preindustrial material technologies, their deterioration processes, and relationship to observed condition of objects are the focus. Students gain first-hand experience critically reviewing literature, as well as using and interpreting examination methods and analytical techniques in the analysis of cultural materials. This is facilitated by access to the equipment and facilities in the Institute's Wolfson laboratories (optical microscopy, X-radiography, scanning electron microscopy, Fourier-transform infrared spectroscopy, Raman spectroscopy, and X-ray diffraction).

Aims

This module is designed to familiarize the student with the properties, technology, and decay mechanisms of pre-industrial materials and to provide them with an understanding of the analytical techniques used in identifying, characterizing, and assessing their condition. As well, module lectures, labs, practical sessions, and assessments will give the student an increased awareness of the important information an object can yield with analysis and technological study.

Learning Outcomes

On successful completion of the module, students should be able to demonstrate/have developed:

- the ability to read and critically evaluate scientific reports and papers with reference to the appropriateness of the techniques employed and the presented data
- the application of the knowledge acquired to the broader field of conservation practice to ensure that interventive procedures protect and reveal the information an artefact carries, so that information is not destroyed or obscured
- the ability to communicate and collaborate with scientists and other specialists on analytical projects related to cultural heritage artefacts
- the ability to propose relevant research and produce a report containing scientific data appropriately presented and interpreted

Methods of Assessment

This course is assessed through two pieces of coursework including: **(a) laboratory report** on work conducted at home (4000 words / 60% of overall mark), and **(b) analytical report** summarizing analysis of historic repair materials on assigned artefact (3000 words / 40% of overall mark).

Communications

- **Moodle is the main hub** for this course.
- Important information will be posted by staff in the **Announcements section of the Moodle page** and you will automatically receive an email notification for these.
  *** Please make sure to inform Caitlin or Dia if you are not receiving emails from Moodle.***
- Please post any general queries relating to module content, assessments, and administration in the module Moodle website or the MS Teams ARCL0106: Conservation Materials Science 2023-24 (or alternatively in Moodle Q&A or via email if you prefer). The forum will be checked regularly.
- For personal queries, please contact the co-ordinator by email.

Week-by-week summary: Term 1

Week	Date	Topic	Lecturers
1	**2 October 2023 -** morning	Introduction to module / Introduction to materials and their structure, analytical methodologies, and data	Caitlin R. O'Grady (CRO)
	afternoon	Research projects and assigned artefacts Artefact sampling	CRO/ Dia Barouda (DB)
2	**9 October 2023 –** morning	Ceramic technology: analysis and interpretation **online via Teams**	DB
	afternoon	Glass, glazes, and faience: technology, chemistry, and deterioration	Victoria (Vic) Lucas
3	**16 October 2023** – morning	Instrumental Overview: pXRF / spot-testing	CRO
	afternoon	Working with assigned artefacts 16.00-17.00: Introduction to Petrie Museum of Egyptian Archaeology and research objects (PMEA)	CRO/DB Anna Garnett
4	**23 October 2023** – morning	Stone technology: chemistry and deterioration / pXRF data interpretation exercise	CRO
	afternoon	Adhesives / Working with assigned artefacts	CRO/DB
5	**30 October 2023** – morning	Instrumental overview: optical microscopy, SEM	CRO
	afternoon	SEM-EDS demonstration (TBC) / Working with assigned artefacts / SEM-EDS data interpretation exercise	RB (TBC)/CRO/DB
6	**6 – 11 November 2023**	**READING WEEK – no lectures** **Please use this time to work on assigned coursework.**	
7	**13 November 2023** – morning	Instrumental overview: FTIR, Raman, XRD	CRO
	afternoon	Working with assigned artefacts / FTIR/XRD data interpretation exercise	CRO/DB
8	**20 November 2023** – morning	Working with assigned artefacts	CRO/DB
	afternoon	Copper and copper alloys: technology and corrosion	Justine Bayley
9	**27 November 2023** – morning	Analytical data, interpretation, and presentation	CRO
	afternoon	Working with assigned artefacts	CRO/DB
10	**4 December 2023** – morning	Iron working: technology and corrosion	Mike Charlton
	afternoon	Working with assigned artefacts	CRO/DB

11	**11 December 2023** – morning	Review of module and discussion of term 2 research project	CRO
	afternoon	Free session	CRO/DB
	15 December 2023	Assessment 1 – Laboratory Report Due	

Week-by-week summary: Term 2

*****More details about Term 2 will be discussed in December 2023*****

Week	Date	Topic	Lecturers
1	**8 January 2024** – morning	Wood technology / Wood deterioration (TBC)	Dean Sully (DS) (TBC)
	afternoon	Working with assigned artefacts including analysis	
2	**15 January 2024** – morning	Plant and animal fibres: chemistry, properties, and deterioration (TBC)	CRO to lead discussion (TBC)
	afternoon	Working with assigned artefacts including analysis	
3	**22 January 2024** – morning	Paper technology: chemistry and degradation	Jillian Harold
	afternoon	Working with assigned artefacts including analysis	
4	**29 January 2024** – morning	Leather, skin, and parchment: chemistry, processing, and deterioration (TBC)	DS (TBC)
	afternoon	Working with assigned artefacts including analysis	
5	**5 February 2024** – morning	Textile technology and examination (TBC)	Margarita Gleba (TBC)
	afternoon	Working with assigned artefacts including analysis	CRO/DB
6		**READING WEEK (12-16 Feb 2024)– no lectures** **Please use this time to work on assigned coursework.**	
7	**19 February 2024** – morning	Pigments: properties and identification	Ruth Siddall
	afternoon	Working with assigned artefacts including analysis	CRO/DB
8	**26 February 2024** – morning	Gypsum, lime mortar, and hydraulic cements	Ruth Siddall
	afternoon	Working with assigned artefacts	CRO/DB
9	**4 March 2024** – morning	Plastics technology: chemistry, properties, and deterioration (TBC)	Katherine Curran (TBC)
	afternoon	Working with assigned artefacts including analysis	CRO/DB
10	**11 March 2024** – morning	Free session / Working with assigned artefacts	CRO
		Working with assigned artefacts including analysis	CRO/DB

11	**18 March 2024** – morning	Module review and discussion of assessment 2 (Analytical Report)	CRO
	afternoon	Free session / assessment 2 (Analytical Report)	CRO
	26 March 2024	Assessment 2 – Analytical Report due	
	26 April 2024	Assessment 2 – Analytical Report Materials for Lending Institution Due	

Lecturers: Anna Garnett, Caitlin R. O'Grady (CRO), Dia Barouda (DB), Dean Sully (DS), Jillian Harold, Justine Bayley, Katharine Curran (TBC), Margarita Gleba (TBC), Mike Charlton, Ruth Siddall, Victoria Lucas

Weekly Module Plan
The module is taught through lectures, experimental work (conducted at home) and discussions. Students will be required to undertake set readings, taped lectures; complete pre- / post-class activities including experimental work (conducted at home); discuss (not examined) their experimental observations and results to be able to actively participate in the discussion; and direct two class discussions on assigned readings (dates to be selected on 5 October 2020).

Terms 1 and 2
Mondays 9.30 – 12.30/13.00 / 14.00 – 17.00: lectures, seminars, discussion sessions

Workload
This is a 30-credit module, which equates to 300 hours of learning time including session preparation, background reading, and researching and writing your assignments. With that in mind, you should expect to organise your time in roughly this way:

60 hours	*Staff-led teaching sessions (lectures, seminars, tutorials, discussion-board sessions)*
120 hours	*Self-guided session preparation (reading, listening, note-taking and online activities), about 6 hours a week*
70 hours	*Reading for, and writing, Coursework 1: laboratory report*
50 hours	*Reading for, and writing, Coursework 2: analysis report*

2. ASSESSMENT

This module will incorporate two pieces of assigned coursework for assessment. Each assignment and possible approaches to it will be discussed in class and in advance of the submission deadline. If students are unclear about the nature of an assignment, they should discuss this with the Caitlin, ARCL0106 Co-ordinator, in advance (via office hours or class Moodle forum). You will receive feedback on your written coursework via Moodle and can discuss your marks and feedback with Caitlin during her office hours.

For more details see the 'Assessment' section on Moodle. The IoA marking criteria can be found in the IoA Student Handbook (Section 12- information on assessment) and the IoA Study Skills Guide provides useful guidance on writing different types of assignment. **Penalties for late submission:** see UCL guidance on penalties (Academic Manual 3.12).

Generative AI and Software
For all ARCL0106 assessments (Laboratory Report and Analytical Report), students are **allowed to use software for language and writing review** (typically Grammarly, ChatGPT, etc.). UCL defines language and writing review as checking "areas of academic writing such as structure, fluency, presentation, grammar, spelling, punctuation, and language translation'.

The use of generative AI software (typically ChatGPT) is not allowed to generate content and will be penalized.

The software and the way it has been used **must be indicated** on the relevant boxes on **submitted coursework cover sheet**.

The library offers guidance on how to acknowledge the use of generative AI and associated software: https://library-guides.ucl.ac.uk/referencing-plagiarism/acknowledging-AI

Assessment 1: Laboratory report – 3500 words / 60% of mark / DUE 15 December 2023 (report for review)

The first piece of coursework is a **laboratory report** divided into two sections: (a) interpretation of analytical data (provided to students) related to an artefact and (b) research proposal for assigned artefact.

Part A (1000 words) will summarize interpretation of analytical data associated with an archaeological artefact and provided as an artefact dossier.

Part B (2500 words) will propose research related to an assigned artefact (pottery from either UCL-IoA collections or UCL-Petrie Museum of Egyptian Archaeology collections). The report should include the following sections: research question and its relationship to your assigned artefact, artefact description and condition; literature review of relevant resources; and proposed analytical techniques with discussion.

Students should take a nominal 70 hours to complete the research/analysis/practical work/writing required for this report.

This assessment is designed to help you develop (or further develop) an area of analytical expertise by investigating material properties and learning to interpret analytical data. The use of images, tables, diagrams are encouraged for this assignment. Additional guidelines regarding the laboratory report format will be discussed in future class sessions.

Assessment 2: Analytical report – 3000 words / 40% of mark / DUE 26 March 2024 (report for review) 26 April 2024 (analytical samples/analyses/report materials to owning institution)
The second item of coursework is an **analytical report** that comprises 40% of the mark for this module focused on the analysis of the repair and degradation history of an assigned archaeological pottery artefact. This will build on the proposed research submitted as assessment 1 (laboratory report: part b) and will rely on UCL-IoA laboratory resources including analytical instrumentation available in the UCL-IoA conservation laboratory and UCL-IoA Wolfson Analytical Laboratory. The report will include the following aspects: research question and its relationship to your assigned artefact; analytical methodology; results and discussion; and conclusions. Students should take a nominal 50 hours to complete the research/analysis/practical work/writing required for this report.

This assessment is designed to help you develop (or further develop) an area of analytical expertise by investigating a specific type of material or problem utilizing resources at the IoA. The use of images, tables, diagrams are encouraged for this assignment. Additional guidelines regarding the report format will be discussed in future class sessions.

Students will be required to submit both paper and electronic versions of their research project report to the institution owning the artefact under study – along with digital copies of relevant images and analytical data with appropriate file names, and any samples removed during the process of analysis. This includes a **summary table** that describes each sample, types of analysis conducted, and results. This must be completed by 26 April 2024.

3. Resources and Preparation for Class

Preparation for class

This course will include a mixture of live lectures given over Microsoft Teams and pre-recorded lectures that you must review ahead of class. You are expected to **read the essential readings as well as watching the pre-recorded lectures (where specified) and completing any online activities on Moodle each week**. Completing the readings is essential for your effective participation in the activities and discussions that we will do, and it will greatly enhance your understanding of the material covered. **Further readings are provided via the online-reading list** (ARCL0106) for you to get a sense of the range of current work on a given topic and for you to draw upon for your assessments.

Online reading list*:* ARCL0106: Conservation Materials Science

Recommended basic texts and online resources
The following books and websites will give you a good introduction and knowledge of materials chemistry, properties, and degradation.

Artioli, G. (ed) (2010). *Scientific methods and cultural heritage: an introduction to the application of materials science to archaeometry and conservation science.* Oxford: Oxford University Press. ISSUE DESK IOA ART 1 / ONLINE

Henderson, J. (2000). *The science and archaeology of materials: An investigation of inorganic materials.* London: Routledge-Taylor & Francis Group. INST ARCH JDA HEN / ONLINE

Jones, A., Clemmer, M., Higton, A., and Golding, E. (1999). *Access to chemistry*. Cambridge: Royal Society of Chemistry. INST ARCH JD Qto JON

Martinón-Torres, M., and Rehren, T. (eds) (2015). *Archaeology, history and science: integrating approaches to ancient materials*. Walnut Creek, CA: Left Coast Press. INST ARCH AJ MAR / ONLINE

National Academy of Sciences (2005). *Scientific examination of art: modern techniques in conservation and analysis (proceedings of the National Academy of Sciences)*. Washington D.C.: National Academy of Sciences. [Online]. [Accessed 28 September 2023]. Available from: http://www.nap.edu/catalog.php?record_id=11413

Pollard, A.M., Batt, C., Stern, B., and Young, S. (2007). *Analytical chemistry in archaeology*. Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press. INST ARCH JDD POL / ONLINE

Pollard, A.M., and Heron, C. (2008). *Archaeological chemistry*. Second edition. Cambridge: Royal Society of Chemistry. INST ARCH JD POL / ONLINE

Price, T.D., and Burton, J.H. (2011). *An introduction to archaeological chemistry*. New York/London: Springer. INST ARCH AJ PRI / ONLINE

Reedy, T.J., and Reedy, C.L. (1992). *Principles of experimental design for art conservation research.* GCI scientific program report. Marina del Rey, CA: J. Paul Getty Trust. [Online]. [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/principles_experiment.pdf

Varella, E.A. (ed.) (2013). *Conservation science for the cultural heritage: Applications of instrumental analysis.* First edition. Lecture Notes in Chemistry Series. Volume 79. Berlin: Springer-Verlag. ONLINE

The following journals and conference proceedings publish relevant case studies:

- Studies in conservation
- International journal of conservation science
- Journal of the American institute for conservation
- Journal of archaeological science
- Archaeometry
- Archaeological and anthropological sciences
- Journal of cultural heritage
- Conservation and management of archaeological sites http://www.maneyonline.com/loi/cma

- ICOM-CC triennial meetings publications including:
  - ICOM-CC metal conferences
  - ICOM-CC Glass and Ceramics conferences
- International symposium on archaeometry
- Materials issues in art and archaeology (Materials Research Society)

Other useful resources and case studies available online or through the UCL Library system:

- AATA Online: Abstracts of International Conservation Literature
- BCIN: Bibliographic Database of the Conservation Information Network
- CAMEO: Conservation & Art Materials Encyclopedia Online Boston Museum of Fine Arts
- ICCROM Catalogue
- Internet Archive
- Science Direct
- Web of Science/Web of Knowledge

4. Syllabus

TERM 1 2023-24

Term 1 Week 1. Monday 2 October 2023: 9:30 Conservation Laboratory

Introduction to module (CRO) / **Introduction to materials, their structure and analytical methodologies applied to cultural heritage** (CRO)

Students will be introduced to the module structure, with discussion of the syllabus, aims, objectives, methods of assessment, etc., as well as the module timetable (including practical sessions, teaching times and locations) highlighted. Lectures will introduce material assessment through investigation of the inter-relationships between material structure, properties, and manufacturing method – all seen through the lens of culture.

Essential reading:

Artioli, G. (ed) (2010). 'Chapter 2: Overview of the analytical techniques', in *Scientific methods and cultural heritage: an introduction to the application of materials science to archaeometry and conservation science.* Oxford: Oxford University Press, pp. 16-198. ISSUE DESK IOA ART 1 / ONLINE

The British Museum (ND). Scientific research glossary of terms. [Online]. [Accessed 28 September 2023]. Available from: https://worldhistorylab.britishmuseum.org/scientific-research-glossary/

Doménech-Carbó, M.T., and Osete-Cortina, L. (2016). Another beauty of analytical chemistry: chemical analysis of inorganic pigments of art and archaeological objects. *ChemTexts* 2, pp. 14. https://doi.org/10.1007/s40828-016-0033-5

Martinón-Torres, M., and Rehren, T. (eds) (2015). *Archaeology, history and science: integrating approaches to ancient materials*. Walnut Creek, CA: Left Coast Press. INST ARCH AJ MAR / ONLINE

Stoner, J.H. (2005). 'Changing approaches in art conservation: 1925 to the present', in *Scientific examination of art: modern techniques in conservation and analysis (proceedings of the National Academy of Sciences)*. Washington D.C.: National Academy of Sciences. [Online]. [Accessed 28 September 2023]. Available from: https://www.nap.edu/catalog/11413/sackler-nas-colloquium-scientific-examination-of-art-modern-techniques-in

Term 1 Week 1. Monday 2 October 14:00 Conservation Laboratory

Research projects and assigned artefacts / Artefact sampling

The first lecture will discuss student research projects and assigned artefacts. The second will focus on sampling with special attention to removal and preparation for analysis. Students will have an opportunity to practice sampling.

Essential reading:

Ariaens, A. (2005). 'Non-destructive analysis and testing of museum objects: an overview of 5 years of research', *Spectrochimica Acta Part B* 60, pp.1503-1516.

Scott, D.A. (1991). '14. Mounting and preparing specimens' in *Metallography and Microstructure of Ancient and Historic Metals*. Los Angeles: The Getty Conservation Institute in association with Archetype Publications, pp. 63-66. [Online.] [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/metallography.pdf

Quye, A., and Strlič, M. (2019). Ethical sampling guidance. January 2019. Icon Heritage Science Group. [Online.] [Accessed 28 September 2023]. Available from: https://www.icon.org.uk/static/3e959f66-580b-406c-a5fce17367aa4c13/iconhsgethicalsamplingguidance-jan2019.pdf

Term 1 Week 2. Monday 9 October 2023: 9:30 Online via Teams

Ceramic technology: analysis and interpretation (Dia Barouda)

This lecture will review ceramic technology and how methods of analysis enable interpretation of composition, structure, and methods of manufacturing.

Essential reading:

Degryse, P., and Shortland, A.J. (2018). 'Characterization of ceramics', in López Varela, S.L. (ed) *The encyclopedia of archaeological sciences.* Hoboken, NJ: John Wiley & Sons. [Online]. [Accessed 23 September 2020]. Available from: https://doi-org.libproxy.ucl.ac.uk/10.1002/9781119188230.saseas0085

Maniatis, Y. (2009). 'Chapter 2. The emergence of ceramic technology and its evolution as revealed with the use of scientific techniques.' In A.J. Shortland, A.J., Freestone, I.C., and Rehren, T. (eds) *From mine to microscope: advances in the study of ancient technology*. Oxbow Limited, pp. 11-27. ONLINE

Orton, C., Tyers P. and Vince, A. (2013). *Pottery in archaeology*. Second edition. Cambridge: Cambridge University Press. INST ARCH KD 3 ORT / ONLINE

Rice, P.M. (1996). 'Recent ceramic analysis: 1. function, style, and origins', *Journal of Archaeological Research* 4(2), pp. 133-161.

Rice, P.M. (1996). 'Recent ceramic analysis: 2. composition, production and theory', *Journal of Archaeological Research* 4(3), pp. 165-202.

Shepard, A.O. (1980). *Ceramics for the archaeologist.* Publication 609. Washington, D.C.: Carnegie Institute of Washington. [Online]. [Accessed 28 September 2020]. Available from: http://publicationsonline.carnegiescience.edu/publications_online/Ceramics_arch.pdf

Term 1 Week 2. Monday 9 October 2023: 14.00 Conservation Laboratory

Glass, glazes, and faience: technology, chemistry, and deterioration (Victoria Lucas)

The chemistry and structure of glasses resulting from different compositions and manufacturing techniques will be discussed. Mechanisms of glass deterioration will be discussed, as will factors affecting the rate of deterioration.

Essential reading:

Davison, S. and Newton, R.G. (2003). 'Chapter 1. Nature of glass', in *Conservation and restoration of glass.* Second Edition. London: Routledge, pp. 1-15. INST ARCH KL DAV ONLINE

Heck, M., and Hoffmann, P. (2002). 'Analysis of early medieval glass beads - the raw materials to produce green, orange and brown colours', *Microchimica Acta* 139 (1-4), pp. 71-76.

Kunicki-Goldfinger, J. (2008). 'Unstable historic glass: symptoms, causes, mechanisms and conservation', *Reviews in Conservation* 9, pp. 47-60.

Pollard, M., and Heron, C. (2008). 'Chapter 5: the chemistry and corrosion of archaeological glass', in *Archaeological chemistry*. Second Edition. Cambridge: The Royal Society of Chemistry, pp. 144-192. ONLINE

Rauch, I. (2010). The conservation and restoration of historical stained and painted glass: an introduction to the problems. [Online]. [Accessed 28 September 2023]. Available from: http://www.cvma.ac.uk/conserv/rauch.html

Term 1 Week 3. Monday 16 October 2023 9:30 Conservation Laboratory

Instrumental Overview: Microchemical spot testing (CRO) / pXRF (CRO)

The first lecture will discuss the use of microchemical spot testing processes, methodology, and implementation in conservation. The second will review the science/physics of portable X-ray fluorescence (pXRF), a technique available at the Institute and in most conservation laboratories, as well as methodologies for its use.

Essential reading:

Bisulca, C., Odegaard, N. and Zimmt, W. (2016). 'Testing for gums, starches and mucilages in artifacts with O-toluidine', *Journal of the American Institute for Conservation* 55(4), pp. 217-227.

Horie, V. (2010). *Materials for conservation: organic consolidants, adhesives and coatings*. Second edition. Oxford: Butterworth-Heinemann. INST ARCH JDE HOR / ONLINE

Potts, P.J., and M. West (eds) (2008). *Portable x-ray fluorescence spectrometry: capabilities for in situ analysis.* Cambridge: Royal Society of Chemistry. ONLINE

Odegaard, N. (2018). 'Microchemical tests in conservation'. In López Varela, S.L. (ed) *The encyclopedia of archaeological sciences.* Hoboken, NJ: John Wiley & Sons. [Online]. [Accessed 28 September 2023]. Available from: https://doi.org/10.1002/9781119188230.saseas0378

Shugar, A.N., and Mass, J.L. (eds) (2012). *Handheld XRF for art and archaeology*. Leuven: Leuven University Press. INST ARCH JKB SHU / ONLINE

Term 1 Week 3. Monday 16 October 2023 14.00 Conservation Laboratory (14.00 – 15.45) and Petrie Museum of Egyptian Archaeology (PMEA) (16.00 – 17.00
Working with assigned artefacts – Conservation lab 14.00 – 15.45
Introduction to Petrie Museum of Egyptian Archaeology and research objects 16.00 – 17.00
Students will work with assigned artefacts and attend an introduction to the Petrie Museum of Egyptian Archaeology (PMEA) and its collections including assigned research artefacts to be held at the PMEA.

Term 1 Week 4. Monday 23 October 2023 9:30 Conservation Laboratory
Stone structure, chemistry, and technology / Adhesives (CRO)
The chemistry, structure and working properties of stone will be discussed as they relate to their forming mechanisms. As well, there will be a brief introduction to how stone is quarried and shaped; followed by how the chemical and physical structure of stone effects its deterioration. The second lecture will provide an overview of the properties of adhesion and adhesives, their chemical/physical relationships, solubility, and failure.

Essential reading:

Ashurst, J., and Dimes, F.G. (eds) (1998). *Conservation of building and decorative stone*. Revised and updated. Oxford: Butterworth-Heinemann. INST ARCH KP 1 ASH / ONLINE

Bayraka, T., and Işik, M.C. (2016). 'Physical characterization, microstructural evaluation, and condition assessment of ancient Ahlat tombstones in the Seljukian cemetery of Ahlat (Turkey)', *International Journal of Architectural Heritage* 10(8), pp. 1025-1040.

Bradley, S. M., and Middleton, A.P. (1988). 'A study of the deterioration of Egyptian limestone sculpture', *Journal of the American Institute for Conservation* 27(2), pp. 64–68.

Horie, V. (2010). *Materials for conservation: organic consolidants, adhesives and coatings*. Second edition. Oxford: Butterworth-Heinemann. INST ARCH JDE HOR / ONLINE

Museums and Galleries Commission (1992). 'Sticking things together', in *Adhesives and coatings. Science for conservators, volume 3.* Conservation science teaching series. London: Routledge, pp. 10-21. INST ARCH JDE CRA ONLINE

Museums and Galleries Commission (1992). 'The strength and stiffness of materials', in *Adhesives and coatings. Science for conservators, volume 3.* Conservation science teaching series. London: Routledge, pp. 64-89. INST ARCH JDE CRA ONLINE

Přykryl, R., and Smith, B.J. (eds) (2007). *Building stone decay: from diagnosis to conservation*. Geological Society Special Publication 271. London: Geological Society. INST ARCH KP 1 PRI / ONLINE

Rodriguez-Navarro, C., Hansen, E., Sebastian, E., and Ginell, W.S. (1997). 'The role of clays in the deterioration of ancient Egyptian limestone sculptures', *Journal of the American Institute for Conservation* 36(2), pp. 151-163.

Stavroudis, C., and Blank, S. (1989). 'Solvents and sensibility', *WAAC newsletter* 11(2): pp. 2-10. [Online]. [Accessed 28 September 2023]. Available from: https://cool.culturalheritage.org/waac/wn/wn11/wn11-2/wn11-202.html

Websites
Igneous, metamorphic, and sedimentary rocks
Igneous rocks
Metamorphic rocks
Sedimentary rocks

Term 1 Week 4. Monday 23 October 2023 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts and interpreting pXRF data interpretation.

Term 1 Week 5. Monday 30 October 2023 9:30 Conservation Laboratory
Instrumental overview: Optical microscopy (CRO) / **Scanning Electron Microscopy** (CRO)
The lecture will provide an overview of optical microscopy, a technique available at the Institute and in most conservation laboratories. This will be followed by a lecture that overviews scanning electron microscopy (SEM) – another technique available at the IoA. There will be a brief introduction to terms and concepts used in analytical chemistry including a brief review of atomic structure, emission spectroscopy, energy sources and detectors. SEM will be discussed in relationship to sample requirements and preparation, as well as produced data and methods of interpretation. Students will have an opportunity to practice SEM-EDS data interpretation.

Essential reading:
Hitachi High-Tech (ND). *Let's familiarize ourselves with the SEM*. Company promotional materials. ONLINE through Moodle module website.

Derrick, M., Souza, L., Kieslich, T., Florsheim, H. and Stulik, D. (1994). 'Embedding paint cross-section samples in polyester resins: problems and solutions', *Journal of the American Institute for Conservation* 33(3), pp. 227-245.

Eastaugh, N., Walsh, V., Chaplin, T., and Siddall, R. (2004). *The pigment compendium: optical microscopy of historical pigments*. Amsterdam/London: Elsevier Butterworth-Heinemann. INST ARCH JDJ EST / ONLINE

Mogk, D.W. (2013). 'A guide to thin section microscopy and polarized light microscope fundamentals', Optical mineralogy and petrography. [Online]. [Accessed 28 September 2023]. Available from: https://serc.carleton.edu/NAGTWorkshops/mineralogy/optical_mineralogy_petrography.html

Scott, D.A. (1991). '10. Reflected polarized light microscopy', in *Metallography and microstructure of ancient and historic metals*. Los Angeles: The Getty Conservation Institute in association with Archetype Publications, pp. 49-50. [Online.] [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/metallography.pdf

Watt, I.M. (1997). *The principles and practice of electron microscopy*. Second edition. Cambridge: Cambridge University press. CUP. PHYSICS L30 WAT / INST ARCH JKA WAT / ONLINE

Term 1 Week 5. Monday 30 October 2023 14.00 Conservation Laboratory and SEM Laboratory
SEM-EDS demonstration – basement labs (RB) (TBC)
Working with assigned artefacts
Students will work with assigned artefacts and a practical in interpreting SEM-EDS data. There is a planned visit to see the SEM-EDS demonstration (TBC).

Term 1 Week 6. READING WEEK. 6 – 10 November 2023
NO LECTURES. PLEASE USE THIS TIME TO WORK ON YOUR READING AND LABORATORY COURSEWORK

Term 1 Week 7. Monday 13 November 2023 – 9.30 Conservation Laboratory
Instrumental overview: **XRD, Raman, FTIR** (CRO)
The lecture will introduce the principles of XRD, FTIR, and Raman. Sample requirements and preparation will be discussed, as well as data produced by each technique and methods of interpretation. Students will have an opportunity to practice FTIR and Raman data interpretation.

Essential reading:
Ashenhurst, J. (2019). Infrared spectroscopy: a quick primer on interpreting spectra. [Online]. [Accessed 28 September 2023]. Available from: https://www.masterorganicchemistry.com/2016/11/23/quick_analysis_of_ir_spectra/

Chércoles Asencio, R., San Andrés Moya, M., de la Roja, J.M., and Gómez, M. (2009). 'Analytical characterization of polymers used in conservation and restoration by ATR-FTIR spectroscopy', *Analytical and Bioanalytical Chemistry* 395(7), pp. 2081-2096.

Derrick, M.R., Stulik, D., and Landry, J.M. (1999). *Infrared spectroscopy in conservation science.* Scientific tools for conservation. Los Angeles: The Getty Conservation Institute. [Online]. [Accessed 28 September 2023]. Available from: http://www.getty.edu/publications/virtuallibrary/0892364696.html?imprint=gtcn&pg=4&res=20?imprint=gtcn&pg=3&res=20?imprint=gtcn

IRUG (2017). Infrared & raman users group. Search spectral database. [Online]. [Accessed 28 September 2023]. Available from: http://irug.org/search-spectral-database?reset=Reset

Leona, M. (2018). 'Raman spectroscopy in conservation' in López Varela, S.L. (ed) *The encyclopedia of archaeological sciences.* Hoboken, NJ: John Wiley & Sons. [Online]. [Accessed 28 September 2023]. Available from: https://doi-org.libproxy.ucl.ac.uk/10.1002/9781119188230.saseas0495

RRUFF (2017). RRUFF project database. [Online]. [Accessed 28 September 2023]. Available from: http://rruff.info/

Smith, G.D., and Clark, R.J.H. (2001). 'Raman microscopy in art history and conservation science', *Reviews in conservation* 2, pp. 96-110.

Term 1 Week 7. Monday 30 October 2023 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts and practical interpreting FTIR/Raman data.

Term 1 Week 8. Monday 20 November 2023 9.30 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 1 Week 8. Monday 20 November 2023 14.00 Conservation Lab
Copper and copper alloys: technology and corrosion (Justine Bayley)
This session will focus specifically on copper and copper alloys and will discuss manufacture, technology, and metallurgy, as well as different alloy compositions and their effects on the metal produced. Appropriate methods of analysis for the study of copper and copper alloy artefacts will also be introduced.

Essential reading:
Chandler, H. (2011). 'Chapter 2. Structure of metals and alloys', in *Metallurgy for the non-metallurgist*. Second edition. Materials Park, Ohio: ASM International. INST ARCH KEB CHA / ONLINE

Chandler, H. (2011). 'Chapter 4. Discovering metals – a historical overview', in *Metallurgy for the non-metallurgist*. Second edition. Materials Park, Ohio: ASM International. INST ARCH KEB CHA / ONLINE

Golfomitsou, S. (2018). 'Deterioration of metals', in López Varela, S.L. (ed) *The encyclopedia of archaeological sciences.* Hoboken, NJ: John Wiley & Sons. [Online]. [Accessed 28 September 2023]. Available from: https://doi-org.libproxy.ucl.ac.uk/10.1002/9781119188230.saseas0174

Scott D.A. (1991). *Metallography and microstructure of ancient and historic metals*. Los Angeles: The Getty Conservation Institute in association with Archetype Publications. [Online.] [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/metallography.pdf

Scott, D.A., Podany, J., and Considine, B.B. (eds) (1994). *Ancient & historic metals: conservation and scientific research*: p*roceedings of a symposium organized by the J. Paul Getty Museum and the Getty Conservation Institute, November 1991.* Marina del Rey, CA: Getty Conservation Institute. [Online]. [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/ancientmetals.html

Term 1 Week 9. Monday 27 November 2023 9.30 Conservation Laboratory
Analytical data, interpretation, and presentation (CRO)
This session will look at the types of analytical data collected to answer research questions and discuss various methods of interpretation and presentation to various audiences.

Essential reading:
Derrick, M.R., Stulik, D., and Landry, J.M. (1999). 'Chapter 5: spectral interpretation', in *Infrared spectroscopy in conservation science.* Scientific tools for conservation. Los Angeles: J. Paul Getty Trust, pp. 82-129. [Online]. [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/infrared_spectroscopy.pdf

Drennan, R.D. (2009). *Statistics for archaeologists – a commonsense approach*. Interdisciplinary contributions to archaeology. Second edition. New York: Springer. [Online]. [Accessed on 25 September 2015]. INST ARCH AK 10 DRE / ONLINE

Reedy, T.J., and Reedy, C.L. (1992). *Principles of experimental design for art conservation research.* GCI scientific program report. Marina del Rey, CA: J. Paul Getty Trust. [Online]. [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/principles_experiment.pdf

Rougier, N.P., Droettboom, M., and Bourne, P.E. (2014). Ten simple rules for better figures. [Online]. [Accessed 28 September 2023]. Available from: http://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003833

Smith, D. (2012). 'Handheld X-ray fluorescence analysis of Renaissance bronzes: practical approaches to quantification and acquisition', in Shugar, A.N and Mass, J.L. (eds) *Handheld XRF in archaeological sciences.* Studies in archaeological sciences 3. Leuven: Leuven University Press, pp. 37-74. INST ARCH JKB SHU / ONLINE

Van Hoek, C.J.G., de Roo, M., van der Veer, G., and van der Laan, S.R. (2011). 'A SEM-EDS study of cultural heritage objects with interpretation of constituents and their distribution using PARC data analysis', *Microscopy and Microanalysis* 17, pp. 656-660. ONLINE

Term 1 Week 9. Monday 27 November 2023 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts and interpreting data practical.

Term 1 Week 10. Monday 4 December 2023 9.30 Conservation Laboratory
Iron working: technology and corrosion (Michael Charlton)
This lecture will discuss iron working, metallurgy, and technology, as well as and corrosion will be discussed. The relationship between technology and different alloy compositions including their effects on the metal produced will also be examined. Time will also be given to discussion of appropriate methods of analysis for the study of iron and steel artefacts.

Essential reading:

Chandler, H. (2011). 'Chapter 2. Structure of metals and alloys', in *Metallurgy for the non-metallurgist*. Second edition. Materials Park, Ohio: ASM International. INST ARCH KEB CHA / ONLINE

Chandler, H. (2011). 'Chapter 4. Discovering metals – a historical overview', in *Metallurgy for the non-metallurgist*. Second edition. Materials Park, Ohio: ASM International. INST ARCH KEB CHA / ONLINE

Golfomitsou, S. (2018). 'Deterioration of metals', in López Varela, S.L. (ed) *The encyclopedia of archaeological sciences.* Hoboken, NJ: John Wiley & Sons. [Online]. [Accessed 28 September 2023]. Available from: https://doi-org.libproxy.ucl.ac.uk/10.1002/9781119188230.saseas0174

Pense, A. (2015) 'Metallurgy 102: structure and degradation of metals', *APT Bulletin* 46(1), pp. 5-11.

Scott, D.A. (1991). *Metallography and microstructure of ancient and historic metals*. Los Angeles: The Getty Conservation Institute in association with Archetype Publications. [Online.] [Accessed 28 September 2023]. Available from: http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/metallography.pdf

Term 1 Week 10. Monday 4 December 2023 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 1 Week 11. Monday 11 December 2023 9.30 Conservation Laboratory
Discussion of experimental report, term 2 assessment, and analytical projects (CRO)
This session will focus on any last-minute questions related to the laboratory report due at the end of the week, as well as discuss work planned for Term 2 including the scope of the analytical report.

Term 1 Week 11. Monday 11 December 2023 14.00 Conservation Laboratory
Free session for students to ask questions, continue working on their first assessment, etc.

TERM 2 – 2024

Term 2 Week 1. Monday 8 January 2024 9.30 Conservation Laboratory (TBC)
Wood technology / Wood deterioration (Dean Sully)
These lectures will focus on wood technology and deterioration in order to answer the following questions: How is wood used, shaped and formed? How does wood macro-structure lend itself to certain tasks?

Essential reading:
Klaassen, R.K.W.M., and Van Overeem, B.S. (2012). 'Factors that influence the speed of bacterial wood degradation', *Journal of Cultural Heritage* 13(3s), pp. 129-134.

Mills, J.S., and White, R. (1994). *The organic chemistry of museum objects*. Second edition. Oxford: Butterworth- Heinemann. INST ARCH JDB MIL / ONLINE

Noël, M. (1988). 'Woodworking in the history of technology', *Endeavour* 12(3), pp. 113-118.

Reinprecht, L. 2016. 'Abiotic degradation of wood', in *Wood deterioration, protection, and maintenance*. Chichester: John Wiley & Sons Inc., pp. 28-61. ONLINE

Term 2 Week 1. Monday 8 January 2024 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 2 Week 2. Monday 15 January 2024 9.30 Conservation Laboratory (TBC)
Plant and animal fibres: chemistry, properties, and deterioration discussion (CRO/TBC)
This session will focus on sources of plant and animal fibres, their structure, appearance, and the processes involved in their production. Please make sure to review the online resources before lecture.

Essential reading/viewing:
Babu, K.M. (2015). 'Natural textile fibres: animal and silk fibres', in Sinclair, R (ed) *Textiles and Fashion: mateirals, design and technology*. Cambridge: Woodhead Publishing Limited, pp. 57-78. ONLINE

Chemixish (2010). Textile fibre burning test. [Online]. [Accessed 28 September 2023]. Available from: https://www.youtube.com/watch?v=kb4tCcnA6jo

Cultural Heritage Science Open Source, CHSOS (2013). Microscopy: identification of textile fibres. [Online]. [Accessed 28 September 2020]. Available from: https://www.youtube.com/watch?v=Rj82EPee0VA

Mills, J.S., and White, R. (1994). *The organic chemistry of museum objects*. Second edition. Butterworth-Heinemann. INST ARCH JDB MIL / ONLINE

North Carolina School of Science and Mathematics (2013). Introduction to fibre analysis – evidence. [Online]. [Accessed 28 September 2023]. Available from: https://www.youtube.com/watch?v=-dIix02SWWQ

Sinclair, R. (2015). 'Understanding textile fibres and their properties: what is a textile fibre?', in Sinclair, R. (ed) *Textiles and Fashion*. Cambridge: Woodhead Publishing Limited, pp. 3-27. ONLINE

Yu, C. (2015). 'Natural textile fibres: vegetable fibres', in Sinclair, R. (ed) *Textiles and Fashion*. Cambridge: Woodhead Publishing Limited, pp. 29-56. ONLINE

Term 2 Week 2. Monday 15 January 2024 14.00 Conservation Laboratory
Working with assigned artefacts – Conservation lab
Students will work with assigned artefacts.

Term 2 Week 3. Monday 22 January 2024 9.30 Conservation Laboratory
Paper technology: chemistry and degradation (Jillian Harold)
This session will focus on the chemistry of paper, as well as manufacturing technologies. Degradation and methods of conservation will also be discussed.

Essential reading:
Calvini, P., and Gorassini, A. (2006). 'On the rate of paper degradation: lessons from the past', *Restaurator: International Journal for the Preservation of Library and Archival Material* 27(4), pp. 275-290.

Havlinova, B., Katuscak, S., Petrovicova, M., Makova, A., and Brezova, V. (2009). 'A study of mechanical properties of papers exposed to various methods of accelerated aging. Part 1: the effect of heat and humidity on original wood-pulp papers', *Journal of Cultural Heritage* 10, pp. 222-231.

Royal Society of Chemistry (2013 March). Saving paper. [Online]. [Accessed 28 September 2023]. Available from: http://www.rsc.org/education/eic/issues/2013March/paper-conservation-cellulose-acid-hydrolysis.asp

Strlič, M., Kolar, J., and Scholten, S. (2004). 'Paper and durability', in Strlič, M., Kolar, J., and Scholten, S. (eds) *Ageing and Stabilisation of Paper*. Ljubljana: National and University Library, pp. 03-09. [Online]. [Accessed on 28 September 2019]. Available from: http://www.science4heritage.org/papylum/Papylum%20Book%20WEB.pdf

Term 2 Week 3. Monday 22 January 2024 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 2 Week 4. Monday 29 January 2024 9.30 Conservation Laboratory
Leather, skin, and parchment: chemistry, processing, and deterioration (DS)
This session will focus on skin/leather as, its acquisition, processing techniques and degradation. The structure of skin will be addressed on a microscopic level to enable the student to identify and locate diagnostic features.

Essential reading:
Covington, T. (2009). *Tanning chemistry: the science of leather*. Cambridge: RSC Publishing. ONLINE

Harris, S. (2014). "Introduction. Leather in archaeology: between material properties, materiality and technological choices', in Harris, S., and Veldmeijer, A.J. (eds) *Why leather? The material and cultural dimensions of leather*. Leiden: Sidestone Press, pp. 9-21. [Online]. [Accessed on 28 September 2019]. Available from: https://www.sidestone.com/books/why-leather

Horie, C.V. (1990). 'Deterioration of skin in museum collections', *Polymer Degradation and Stability* 29(1), pp. 109-133.

Kite, M. (2006). *Conservation of leather and related materials*. Oxford: Butterworth-Heinemann. INST ARCH KI KIT / ONLINE

Michel, A. (2014). 'Skin deep: an outline of the structure of different skins and how it influences behavior in use. A practitioner's guide', in Harris, S., and Veldmeijer, A.J. (eds) *Why leather? The material and cultural dimensions of leather*. Leiden: Sidestone Press, pp. 23-40. [Online]. [Accessed on 28 September 2023]. Available from: https://www.sidestone.com/books/why-leather

Term 2 Week 4. Monday 29 January 2024 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 2 Week 5. Monday 5 February 2024 9.30 Conservation Laboratory (TBC)
Textile technology and examination (Margarita Gleba)
This session will focus on the production of textiles and woven structures. Methods of examination are discussed as they relate to the analysis of woven materials in order to discover the methods employed in their manufacture.

Essential reading:

Andersson Strand, E.B., (ed) (2009). *North European symposium for archaeological textiles*. Oxford: Oxbow Books. INST ARCH KJ Qto STR / ONLINE

Gillis, C. and Nosch, M.-L.B. (eds) (2007). *Ancient textiles: production craft and society*. *North European symposium for archaeological textiles*. *Proceedings of the First International conference on ancient textiles, held at Lund, Sweden, and Copenhagen, Denmark, on March 19-23, 2003.* Ancient Textile Series. Oxford: Oxbow Books. INST ARCH KJ GIL / ONLINE

O'Conner, S.A., and Brooks, M.M. (2007). *X-radiography of textiles, dress and related objects*. Oxford: Elsevier/Butterworth-Heinemann. INST ARCH KJ OCO / ONLINE

Term 2 Week 5. Monday 5 February 2024 14.00 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 2 Week 6. READING WEEK. 12 – 16 February 2024
NO LECTURES. PLEASE USE THIS TIME TO WORK ON YOUR LABORATORY COURSEWORK

Term 2 Week 7. Monday 19 February 2024 9.30 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 2 Week 7. Monday 19 February 2024 14.00 Conservation Laboratory

Pigments and pigment identification (Ruth Siddall)

This lecture will introduce the three categories of pigments (inorganic, organic and synthetic) and examine the use in the historical record up to 1600 AD. Pigment nomenclature will be discussed, as will their physical properties.

Essential reading:

Eastaugh, N., Walsh, V., Chaplin, T., and Siddall, R. (2004). *The pigment compendium: a dictionary and optical microscopy of historical pigments*. Amsterdam/London: Elsevier Butterworth-Heinemann. INST ARCH JDJ EST / ONLINE

Mogk, D.W. 2013. Optical mineralogy and petrography. [Online]. [Accessed 28 September 2023]. Available from: http://serc.carleton.edu/NAGTWorkshops/mineralogy/optical_mineralogy_petrography.html

-See A guide to thin section microscopy and polarized light microscope fundamentals.

Mactaggart, P. and Mactaggart, A. (ND). Pigment ID. [Online] [Accessed 29 September 2023]. https://academicprojects.co.uk/pigment-id-by-mactaggart/

Samanian, K. (2015). 'Identification of green pigment used in Persian wall paintings (AD 1501 – 1736) using PLM, FT-IR, SEM/EDX and GC-MS', *Archaeometry* 57(4), pp. 740-758.

Siddall, R. (2018). 'Mineral pigments in archaeology: their analysis and the range of available materials', *Minerals* 8(5), 35 pages. https://doi.org/10.3390/min8050201

Recommended references:

Bregnjoi, L. (2006). *Paint research in building conservation*. London: Archetype Publications. INST ARCH KN 1 Qto BRE

Dawson, J., Rozeik, C., and Wright, M.M. (eds) (2010). *Decorated surfaces on ancient Egyptian objects: technology, deterioration and conservation*. London: Archetype Publications in association with the Fitzwilliam Museum and Icon Archaeology Group. INST ARCH LA Qto DAW

Delamare, F. (2000). *Colour: making and using dyes and pigments*. Trans. S. Hawkes. London: Thames & Hudson. INST ARCH JDJ DEL

Feller, R.L. (ed) (1986). *Artists' pigments: a handbook of their history and characteristics. Volume 1.* Washington/London: National Gallery of Art/Archetype Publications (distributor). INST ARCH JDJ FEL / ONLINE

Fitzhugh, E.W. (ed) (1997). *Artists' pigments: a handbook of their history and characteristics. Volume 3*. Washington/Oxford: National Gallery of Art/Oxford University Press (distributor). INST ARCH JDJ ART / ONLINE

Harley, R.D. (2001). *Artists' pigments c. 1600-1835: a study in English documentary sources.* Second revised edition. London: Archetype Publications. INST ARCH JDJ HAR

Robinson, P.C. (1992). *Qualitative polarized-light microscopy*. New York: Oxford University Press/ Royal Microscopical Society. INST ARCH AJ ROB

Roy, A. (ed) (1993). *Artists' pigments: a handbook of their history and characteristics. Volume 2.* Washington/Oxford: National Gallery of Art/Oxford University Press (distributor). INST ARCH JDJ ART / ONLINE

Term 2 Week 8. Monday 26 February 2024 9.30 Conservation Laboratory
Working with assigned artefacts
Students will work with assigned artefacts.

Term 2 Week 8. Monday 26 February 2024 14.00 Conservation Laboratory
Ruth Siddall: Gypsum, lime mortar and hydraulic cements (Ruth Siddall)
This session will cover the raw materials and the chemistry involved in the production of historically used plasters, mortars, and cements. The properties and uses of the different materials are explained and relevant methods of scientific analysis employed in the study of such materials will be discussed.

Essential reading:
Abd El Salam, A.A. (2004). *Egyptian and Graeco-Roman wall plasters and mortars: a comparative scientific study.* Oxford: Hedges. ONLINE

Caroselli, M., Ruffolo, S.A., and Piqué, F. (2021). 'Mortars and plasters – how to manage mortars and plasters conservation', *Archaeological and Anthropological Sciences* 13(11), article 188.

Gliozzo, E., Pizzo, A., and La Russa, M.F. (2021). 'Mortars, plasters and pigments – research questions and sampling criteria', *Archaeological and Anthropological Sciences* 13(11), article 193.

La Russa, M.F., and Ruffolo, S.A. (2021). 'Mortars and plasters – how to characterize mortar and plaster degradation', *Archaeological and Anthropological Sciences* 13(10), article 165.

Livesey, P. (2013). 'The rise, fall, and revival of natural cements in the developing pattern of binders', *The Journal of the Building Limes Forum* 20, pp. 41-46.

Wilk, D., Bratasz, Ł., and Kozłowski, R. 'Shrinkage cracking in Roman cement pastes and mortars', *Cement and concrete research* 53, pp. 168.175.

Recommended reading:
Eckel, E. (2005). *Cements, limes and plasters: their materials, manufacture and properties.*
With new introductions by P. Livesey and W.G. Hime. Shaftesbury: Donhead. Bartlett TP877 .E2 2005

Gowing, R., and Pender, R. (eds) (2007). *All manner of murals: the history, techniques and conservation of secular wall paintings. Proceedings of the Secular Wall Paintings Symposia organised by the Icon Stone and Wall Paintings Group and supported by English Heritage, London*. London: Archetype Publications.
INST ARCH KN 1 Qto GOW

Henry, A., and Stewart, J. (eds) (2011). *Mortars, renders & plasters*. Practical building conservation. Farnham, UK: Ashgate and English Heritage. Bartlett TA436.P73 2011
-focus on Materials & History of Use – pp. 1-120; and Deterioration & Damage – pp. 121-162.

Term 2 Week 9. Monday 4 March 2024 9.30 Conservation Laboratory (TBC)
Plastics technology: chemistry, properties, and deterioration discussion section (Katherine Curran)
This session will discuss any questions related to the chemistry, properties, and technology of plastics as they relate to the production of art objects, conservation materials, and deterioration. Please review PPT lecture before the Monday morning discussion.

Essential reading:
Getty Conservation Institute (2014). 'Conservation of plastics', *Conservation perspectives: the GCI Newsletter* 29(1). [Online]. [Accessed 28 September 2019]. Available from:

http://www.getty.edu/conservation/publications_resources/newsletters/29_1/

Horie, V. (2010). *Materials for conservation: Organic consolidants, adhesives and coatings.* Second edition. Amsterdam/London: Butterworth-Heinemann. INST ARCH JDE HOR / ONLINE

----. (2011). 'Does what we want exist?' In *Adhesives and consolidants for conservation: research and applications symposium proceedings / Adhésifs et consolidants pour la conservation: recherche et applications: les actes.* Ottawa: Canadian Conservation Institute. Moodle module website

Shashoua, Y. (2008). *Conservation of plastics: materials science, degradation and preservation*. Amsterdam/London: Butterworth-Heinemann. INST ARCH LA SHA / ONLINE

Strlič, M., and Curran, K. (2014). Editorial. *Polymer Degradation and Stability* 107, pp. 189-190. http://dx.doi.org/10.1016/j.polymdegradstab.2014.07.001

Term 2 Week 9. Monday 4 March 2024 14.00 Conservation Laboratory
Working with assigned artefacts
Students may use this session to work with their assigned artefacts, ask questions and work on their analytical report.

Term 2 Week 10. Monday 11 March 2024 9.30 Conservation Laboratory (TBC)
Free session
Students may use this session to work with their assigned artefacts, ask questions and work on their analytical report.

Term 2 Week 10. Monday 11 March 2024 14.00 Conservation Laboratory
Working with assigned artefacts
Students may use this session to work with their assigned artefacts, ask questions and work on their analytical report.

Term 2 Week 11. Monday 18 March 2024 10:00 Conservation Laboratory
Module review and discussion of final assessment (CRO)
This session will focus on any last-minute questions related to the final assessment (analytical report) due at the end of the week.

Term 2 Week 11. Wednesday 18 March 2024 14:00
Free session

5. FURTHER READING

Please see further reading available on the UCL Library ARCL0106 (Conservation Materials Science).