Chapter 5
Heritage Science: A Report

Brendan Dooley and Armida de la Garza

Abstract Heritage Science is a growing interdisciplinary field that illustrates the benefits of STEAM in action. It attempts to join specific competences in material science with the interpretative skills of the humanities and social sciences in order to understand and assist with the conservation of artefacts and sites that different cultures and societies value, while also assisting with the curation of tangible artistic and archaeological capital of interest from economic and development perspectives. This chapter presents a report of a 2-day symposium that took stock of the interdisciplinary field, presented existing projects and introduced new avenues for future research.

Keywords Heritage science · Heritage conservation · Heritage · Archaeological capital · Interdisciplinary collaboration

Heritage science is a growing interdisciplinary field that very aptly illustrates the benefits of STEAM in action. In brief, it attempts to join specific competences in material science with the interpretative skills of the humanities and social sciences in order to understand and assist with the conservation of artefacts and sites that different cultures and societies value while also assisting with the curation of tangible artistic and archaeological capital of interest from economic and development perspectives. As national heritage sites and artefacts often seem to be on a race between preservation and destruction, increasing awareness of the threats posed by natural and anthropogenic forms of damage, along with a perception of the tangible features of cultural distinctiveness, has added urgency to protecting and recording that which may one day disappear forever. More and more scholars in humanities and natural science fields in Europe see this diverse and interdisciplinary field as an ideal means to cater for their needs. Along with the European Research Infrastructure for Heritage Science led by Italy, other structures are emerging, such as access,

B. Dooley
University College Cork, Cork, Ireland

A. de la Garza (✉)
College of Arts, Celtic Studies and Social Sciences, University College Cork, Cork, Ireland
e-mail: adelagarza@ucc.ie

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research and technology for the conservation of the European Cultural Heritage (EU-ARTECH), Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/Restoration (CHARISMA), Integrated Platform for the European Research Infrastructure ON Cultural Heritage (IPERION CH) and Advanced Research Infrastructure for Archaeological Dataset Networking in Europe (ARIADNE). The new journal entitled *Heritage Science* provides specific examples of the exciting promise that this arts and science collaboration offers:

> By examining the pigments in a painting, can we tell how it was painted, where it was painted and even whether it is a forgery? By looking at dyes in a textile can we find out about the origin of manufacture and the geographical route it took to get to its destination and hence about trade routes? By analysing the metal content of a coin, can we tell about the economic factors of the time and even whether it was created from melted down coins from a neighbouring country? (Brereton 2013)

To answer such questions, scientific approaches provide additional insight. One might add paleopathology, the analysis of historic remains to test for disease and other causes of death. The use of modern computer techniques, together with the knowledge of forensic science that is these days often displayed on television programmes, has started to familiarise the general public with heritage science. See, for instance, the account of maritime archaeologist Margaret Rule who explains how soil analysis and remote prospection using ground-penetrating radar or a magnetometer enabled researchers to present an accurate reconstruction of a lost eighteenth-century garden, which was then shown on television (Rule 2006, p. 1).

There is no denying that there has been a slow but steady movement towards the adoption of scientific methods in cultural studies, not to mention in literary history, historiography and archaeology. Moreover, ‘new instrumentation and approaches are required to study objects in museums, posing special challenges, for example miniaturisation to bring non-invasive measurements into the museum shelves, screening large numbers of objects, finding out about hidden layers in paintings, checking for possible decay’ (Brereton 2013). All of these require methods that are tailored to the specific needs of cultural conservation.

A 2-day symposium and masterclass was held at University College Cork (UCC) on 2–3 November 2017 to explore the challenges and opportunities of heritage science, with a view to demonstrating the ways in which specific projects and interests may be enhanced and developed when viewed within a heritage science perspective.

The Symposium

Presentations started with Professor Brendan Dooley from Digital Arts and Humanities at UCC, who introduced the project ‘The Venice Time Machine’. This project aims to build a virtual reality representation of the city of Venice that will be fully cross-referenced to a digital archive of the city’s cultural heritage that covers

more than a thousand years of its history.[1] When completed, it will show the way that news, money and commercial goods circulated in the city and point to migration and artistic/architectural patterns while also becoming an example of the way in which such big data applications may be used for other cities in the future.

The keynote speech was provided by Professor Matija Strlič from University College London. In addition to providing a broad overview of the state of the field, Professor Strlič presented recent research into the smell of old paper and the use of volatiles as markers for degradation. The research involves a study of the various chemical substances that cause the characteristic smell of old books and recreating this smell in the laboratory for its application in museums and libraries special collections in order to add a sensory dimension to visitors' experience. The research, co-authored by Cecilia Bembibre, has attracted considerable media interest and received extensive coverage, including in the form of a video.[2]

Another highlight to the symposium was provided by Daniela Iacopino, an expert in nanomaterials from Tyndall Research Institute with a great interest in inks. Following a fascinating introduction on the nanoparticles of gold and its various colourings, which can include red hues, she then discussed the many ways in which applications of nanoparticles are helping with the restoration and preservation of paintings and drawings. Among the examples Iacopino provided was the case of a painting that had been defiled by graffiti, which was restored through the application of a nano-gel that had been chemically modified to selectively dissolve the graffiti layer, leaving the painting underneath intact. A gel employing a different formulation was similarly used to clean traces from cellotape on a number of modern drawings. And nano-cellulose applied to paper, either made from wood pulp or linen, can help to restore tears and damage caused by the passage of time.

Two presentations in the symposium were devoted to issues related to the conservation of heritage books. The first was delivered by Crónán Ó Doibhlin, Head of Research Collections and Communications at Boole Library in University College Cork, Ireland, who discussed conservation and preservation issues in the context of library resources. A resource like the Great Book of Ireland,[3] a manuscript anthology of modern Irish art and literature acquired in 2013 and held in Special Collections at Boole Library, presents special problems of conservation, although it was only made in 1989–1991. But even in such a short period of time, some of the work included there has deteriorated and in certain cases become illegible, challenging the current goal of keeping the book for a thousand years as a testimony of Irish heritage.

[1] See 'A Virtual Time Machine for Venice' at https://www.youtube.com/watch?v=uQQGgYPRWfs

[2] The video is entitled 'Smell of Heritage: The Historic Book Odour Wheel' and can be viewed here: https://www.youtube.com/watch?time_continue=123&v=7gO4jaTmAz0. The paper is Cecilia Bembibre and Matija Strlič, 'Smell of heritage: a framework for the identification, analysis and archival of historic odours', *Heritage Science* 5:2 (2017).

[3] For more on the Great Book of Ireland, see: https://www.youtube.com/watch?v=EuOyE0i16pE

Professor Pádraig Ó Macháin, Head of Modern Irish at UCC, then explored the thousand-year-old tradition of Irish manuscript production, uninterrupted until the development of reliable Irish printing in the nineteenth century. Due to the vicissitudes of Irish collections around the world, digitization has been a particular boon, such that technology now allows comparison between exemplars and the joining of separated fragments in ways hitherto impeded by distance between repositories when not prevented by the sheer fragility of the material.

The last presentation by Mary Teehan from the Discovery Programme in Dublin involved an introduction to current and past projects in Ireland, such as WODAN (Wood and Charcoal Database); LIARI (Late Iron Age and 'Roman Ireland'); 3D ICONSl, described as 'a collection of highly accurate 3D models, images, texts and videos of over 130 iconic and internationally important monuments and buildings from Ireland'; and CHERISH (Climate, Heritage & Environments of Reefs, Islands and Headlands). She pointed out her role in the new ERIHS network (European Research Infrastructure for Heritage Science) while directing attention to the challenges of inter- and transdisciplinarity, in fields and studies where stakes are so high not only for the natural, biological and human sciences and humanities but also for research institutions and governments.

The symposium ended with a discussion of the various meanings of the word 'heritage', in the light of the specific collaboration between art and science that 'heritage science' is arising. In the future, other symposia will aim to cover fields that it was not possible to include this time, such as the conservation of film either in celluloid or in digital form, and also the use of genetic modification of plants to preserve and develop the natural heritage of botanical gardens and national parks.

All in all, the symposium demonstrated many concrete results of current and past interdisciplinary collaborations between and among arts and science.

References

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