Institution: University of Lincoln		
Unit of Assessment: 28 - History		
Title of case study: Imprint: Furthering Forensic Science and Heritage Agendas through Medieval History		
Period when the underpinning research was undertaken: 2011 - 2019		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): HOSKIN Philippa	**Role(s) (e.g. job title):** Professor of Medieval Studies	**Period(s) employed by submitting HEI:** 13 Sep 10 – 30 Sep 19
Period when the claimed impact occurred: 2016 - 2019		
Is this case study continued from a case study submitted in 2014? N		

1. Summary of the impact (indicative maximum 100 words)

Imprint is an innovative collaboration between history and forensic science, that uses cutting-edge technology in digital imaging to identify handprints on medieval wax seals. The project's practice and findings have led to:

a. significant improvements in the usability and stability of forensic instruments.

b. *Imprint* has also worked with heritage professionals to improve the conservation, cataloguing and interpretation of medieval seals and documents, and has

c. shared its findings with a wide range of audiences, to develop public knowledge of medieval life.

2. Underpinning research (indicative maximum 500 words)

The Imprint project was a collaboration between its PI, Philippa Hoskin (University of Lincoln), and Co-I, Elizabeth New (Aberystwyth University). The key starting point was Hoskin's role as General Editor and Director of the British Academy-funded English Episcopal Act project, which publishes editions of the administrative documents that were crucial to the running of medieval bishops' dioceses. This work developed into Hoskin's research on sealing - the method by which parties authenticated and signalled their consent to a document's contents by using a matrix to impress a unique design onto a wax seal attached to the document. Hoskin became particularly interested in the possibility of analysing the handprints that survive on the wax – a resource hitherto unexplored by historians. She designed a pilot project in conjunction with New, funded by the University of Lincoln (2013), where 200 medieval seals from Hereford Cathedral were examined by forensic scientists – the first such analysis to be undertaken. This established the feasibility of the methodology developed by Hoskin and New and led directly into the AHRC-funded project, Imprint (January 2016-December 2018, Hoskin as PI).

Since, by the thirteenth century, a wide variety of institutions and individuals owned matrices, their motifs and text provide invaluable evidence about identity and representation, especially as the documents to which seals were often attached survive in great numbers in British archives. Imprint analysed 1000 handprints on seals and made a number of important discoveries about the practice of sealing and its role in public display. In particular, Imprint overturned the prevailing assumption that an individual needed to physically impress their own matrix into a wax seal – this action was often performed by third parties. Other key findings related to: 1) the use of different seal motifs in varying social groups and geographical areas; 2) the practice of sealing by women; and 3) the composition and origin of medieval wax. These findings have been published in a number of articles and essays by Hoskin (see section 3).

The project's key research output, though, is www.imprintseals.org - an open access database of 1000 medieval seals, that includes high-quality images of the handprints on the wax, made with cutting-edge forensic equipment. The process of creating these images led directly to improvements in the operation of the equipment. The database also created and connected colour images of the matrix impressions and the documents, providing information about the parties and contents of the documents, the wording and motifs on the seals, and the nature and quality of the handprints. It also links impressions of the same matrix and of the same handprints, drawing on forensic techniques of both manual and digital analysis. Research on handprints on medieval seals that was previously impossible can now be completed in a matter of minutes. Unlocking the information in this pioneering way has democratized its use for everyone interested in medieval history and the history of handprints.

3. References to the research (indicative maximum of six references)

3.1 The key output of the research is the open access database found at www.imprintseals.org This hosts the database of seals, associated documents and handprints, including over 6000 images.

3.2 Philippa Hoskin, *English Episcopal Acta 38: London 1229-1280* (Oxford: OUP, 2011) Available on request.

3.3 Philippa Hoskin, 'Authors of bureaucracy: developing and creating administrative systems in English episcopal chanceries in the second half of the thirteenth century', in: *Patrons and professionals in the middle ages: proceedings of the 2010 Harlaxton Symposium. Harlaxton Medieval Studies* (Stamford: Paul Watkins / Shaun Tyas, 2012), pp. 61-78. Available on request

3.4 Philippa Hoskin, 'Administration and Identity: Episcopal Seals in England from the Eleventh to the Thirteenth Century' in *A Companion to Seals in the Middle Ages*, ed. Laura Whatley (Leiden: Brill, 2019), pp. 195-220. https://doi.org/10.1163/9789004391444_009

3.5 Philippa Hoskin and Elizabeth New, 'By the impression of my seal". Medieval identity and bureaucracy: a case study', *The Antiquaries Journal*, 99 (2019), 190-212. https://doi.org/10.1017/S0003581519000015

4. Details of the impact (indicative maximum 750 words)

The project's impact is multifaceted, interacting with businesses, forensic scientists, heritage professionals and the general public. It has demonstrated how medieval sources can be used to solve modern technical and professional problems, as well as developing heritage practices and allowing the public to explore medieval history in new ways, providing free access to a hitherto inaccessible area of medieval life and work.

Improving Technical Equipment. Whilst working with scientists to examine the handprints found on the back of medieval wax seals, the Imprint project is having an impact upon forensic science and the makers of forensic instruments. Imprint's use of the multispectral Crime Lite Imager (CLI; usually used for crime-scene analysis) in unusual circumstances with challenging materials, in a variety of different environments, has allowed both forensic specialists and the equipment's creators, Foster & Freeman Ltd, to discover more about how the equipment works under different environmental circumstances, and this has enabled them to make improvements to the 'usability and stability' of both the hardware and software of the CLI [5:1].

Furthering Scientific Discovery. The forensic partners on the project, Forensic Focus Ltd, have also been able to discover new information about the extent of the distortion of prints on uneven surfaces and malleable materials and about the effect on print quality and preservation of different chemical components mixed with wax [5.2]. As Forensic Focus say: 'the project is

assisting modern day forensic science with respect to effective image capture of marks on highly curved surfaces, an issue we have battled with for years' [5.3].

Protecting and Interpreting the National Heritage. The project had five partner heritage institutions (Westminster Abbey, the National Library of Wales and Hereford, Exeter and Lincoln Cathedrals), for whom it provided conservation surveys of medieval seals and associated material, leading directly to improved conservation practices (e.g. bespoke protective pouches to preserve seals). The Archivist of Exeter Cathedral commented: 'The successful long-term preservation of these documents is now much more secure' as a result of Imprint's work [5.4]. The project has also increased knowledge amongst heritage professionals about cataloguing and interpreting seals, facilitated outreach sessions and through its database has enhanced the material digitally available at each archive [5.4 & 5.5]. Furthermore, the CLI has been used to help in the understanding of aspects (e.g. dry point drawings) of exceptionally significant cultural items, including the Exeter Book (UNESCO Memory of the World status) [5.4]. More widely, the project has also shared its findings at a workshop for professionals on digital experimentation and archives at The National Archives (28 June 2018) [5.8,p.3].

Improving Professional and Public Knowledge of Medieval Life. Imprint has also provided workshops and public lectures to both heritage professionals and the general public, furthering knowledge of medieval seals and the project's findings, and encouraging new ways of thinking about medieval life. These have included public workshops at Exeter, Hereford, and London (2018) that engaged with conservation professionals, archivists, local historians and palmistry experts and received extremely positive feedback [5.6]. Workshops on sealing for year 7 students in schools enhanced their work on medieval history and particularly on medieval documents (such as Magna Carta) - school staff commented on the 'invaluable' learning experience the workshop provided [5.7]. Imprint has also contributed to public festivals, including the European Commission-funded LiGHTS Nights events in September 2016 and 2017 and the Festival of Creativity, University of Lincoln, May 2017, and in staging further public exhibitions, for example a pop-up exhibition of medieval women's seals at Corpus Christi College Oxford (January 2018). Hoskin and New have also given a range of talks, including at Magdalen College, Oxford (5 June 2017) and a public lecture at the Society of Antiquaries on 25 April 2017 [5.8]. The project has featured in popular magazines, including *BBC History Magazine* in January 2016, and *New Scientist* in December 2016. People are also drawn to the project website through interactive tweets and blogs [5.8].

5. Sources to corroborate the impact (indicative maximum of 10 references)

5.1 Letter from Foster & Freeman confirming the project's contribution to the development of the Crime Lite Imager.

5.2 Professional publication: McGarr, Luke and Stow, Karen and Hoskin, Philippa and New, Elizabeth (2016) 'A preliminary study of fingerprint ridge detail on medieval seals from Hereford Cathedral'. *Fingerprint Whorld: the International Journal of the Fingerprint Society*, 41 (160), 4-14.

5.3 Letter from Forensic Focus noting the use of project data in forensic work.

5.4 Email from archivist at Exeter Cathedral noting the project's contribution towards conservation surveys.

5.5 Letter from former archivist at Hereford Cathedral.

5.6 Feedback forms from outreach event at Exeter (2018).

5.7 Email from Caistor Grammar School.

5.8 Online resources and references:

- 'Fingertips and Sealing Wax', *New Scientist*, 3104, 17 December 2016, 64-5.
- BBC History podcast and magazine
- Imprint blog.
- Imprint YouTube
- Hits on and comments about Society of Antiquaries online recording of public lecture.
- Imprint Facebook account.
- Imprint Twitter account.