Reflections on the Academic Book of the Future[1]
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Abstract

A thorough, lucid and informative survey of the various kinds of transformations of the academic book in the digital era.

Introduction

This article had its genesis in the joint paper we gave at the *Scholarly Networks and the Emerging Platforms for Humanities Research and Publication* Colloquium in April 2015. At that point, we were at the beginning of the Academic Book of the Future Project, which had been funded to run for two years from October 2014 by the UK's Arts and Humanities Research Council and the British Library. As we write this contribution, the Project has just launched its two final reports, a Project Report by Marilyn Deegan and a Policy Report by Michael Jubb (Deegan, 2017; Jubb, 2017).

The Project was conceived of in response to widespread concerns about books, publishing, libraries and the academy. Declining monograph sales, rising serials prices, funding problems, rapidly-changing new technologies, shifting policy landscapes, increasing pressure on academics to do more with less, all contributed to a sense of unease about the health of the academic book in the arts and humanities, and indeed about the health of the disciplines themselves. The Project was run jointly by University College London and King's College London, with consultancy support from the Research Information Network (academicbookfuture.org). It also drew on expertise from across a widespread community coalition of academics (from students to senior professors), publishers, intermediaries and policy makers. Some hundreds, if not thousands, of individuals have been involved, and many useful deliverables produced. The Project had, and continues to have, considerable impact, and some of its activities, for instance Academic Book Week (acbookweek.com), will continue for the foreseeable future.

As the famous (and variously attributed) quote goes, predictions are difficult, especially about the future. But there are a number of new developments that may point to diverse futures for different kinds of books. Some of these are infrastructural and hold out promise of sustainable models; others are individual and experimental, and may point to some new and interesting possibilities. We need both, but we must bear in mind that some of the new models will not stand the test of time.

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[1] A version of this article also appears as Chapter 8 in the Academic Book of the Future

Report (Deegan 2017).

The general assumption is that, with a few exceptions, any new models for the book (academic or otherwise) will be digital. However, during the course of the Project we have observed an enduring attachment to print that is neither sentimental nor habitual: print just happens to do some things particularly well, and will no doubt continue to do so. The relationship between print and digital technology is a complex one, and the development of non-print book forms of increasing functionality, alongside this enduring popularity and usefulness of the printed book, has been a key research area for the Project, (see O'Sullivan, 2017). Print books have been produced using largely electronic means for several decades, and in parallel with developments in the commercial world, the academic community, notably in digital humanities (DH), has been influential in the advancement of methods and standards for the conversion and publication of digital text and media, and in producing pioneering innovative resources.

Definitions

There are several terms used for books delivered in non-print form: e-books, enhanced e-books, enhanced monographs, and it is difficult to distinguish precisely between these. Normally, an e-book is a digital version of print, delivered in a standard publishing format (PDF, ePub etc); it may have some added features (links, searchability) but little functionality beyond this. Enhanced e-books have more functionality, and may include maps, diagrams, narration, multimedia, and there have been some publisher experiments with the development of book apps, for example the Faber/Touch Press versions of Shakespeare's *Sonnets* and T.S. Eliot's *The Waste Land*.[2] It is difficult to know where the boundary between an enhanced e-book/book app and an enhanced monograph lies. There is a continuum of functionality, though enhanced e-books are more likely to be stand-alone rather than networked. The Andrew W. Mellon Foundation has created a set of features for the (enhanced) monograph of the future (again, assumed to be digital), based on discussions across the humanities in the US. They should: be fully interactive and searchable online together with primary sources; support platform independent annotation; incorporate privacy metrics; be preservable for the long term; be portable across reader applications. They should also be fully peer reviewed and of high quality (Waters, 2016).

The adoption of scholarly e-books and enhanced monographs has been much slower than the adoption of e-journals. Physical books have affordances that enable users to do things that are much more difficult with e-books (including annotating them, having several open at the same time, and so on). Numerous recent studies, confirmed by our discussions with scholars, have also shown that mental retention of complex texts is better with print than electronic. See for instance OAPEN's Final Report (Collins et al, 2016) and Myrberg and Wiberg (2015). The Robb (2015) review of *Words Onscreen: The Fate of Reading in a Digital World* by Naomi Baron reports that in a survey of over 300 university students in the U.S., Japan, Germany, and Slovakia, they found a near-universal preference for print, especially for serious reading. Baron concludes that 'digital reading is fine for many short pieces or light content we don't intend to analyze or reread', but not for longer pieces that we need to absorb and retain (xii). But see also

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[2] Shakespeare's Sonnets. http://shakespeares-sonnets.touchpress.com. Accessed 1 July 2017.

The Waste Land. http://thewasteland.touchpress.com. Accessed 1 July 2017.

Jabr (2013) who cites a number of experiments which showed that retention and knowledge creation from long texts was enhanced when participants had read printed texts rather than digital. However, he also suggests that perhaps we are making the wrong comparisons, and that 'when it comes to intensively reading long pieces of plain text, paper and ink may still have the advantage'. But this is not the only way to read, and these are not the only kinds of texts we are exposed to.

There was never any assumption that a new device would be needed for e-journals, but for books there have been many years of development spent in search of something that would mimic as closely as possible the format of the printed book. 1990s experiments in e-book readers were mostly failures because of limited capacity, an uncomfortable reading experience, high price and lack of content. The runaway success has been Amazon's Kindle, which achieved market dominance largely through its critical mass of available titles, and its availability as both a standalone device and an app that can run on phones, tablets, etc., with the ability to synchronize the reading experience across all of these. All kinds of books are available, from trade novels to complex academic works. The experience of reading on Kindle and other readers, however, is somewhat linear, which makes novels and other linear formats easy to read, but is not well adapted for more complex works like scholarly monographs. In addition, the ownership of the text remains with the provider, and not with the reader, who can find books withdrawn from their Kindle portfolio any time Amazon decides; see the 2009 case regarding George Orwell's *1984*, for instance (Johnson, 2009). E-book providers license the books to their customers, and licensing is not owning. Most scholarly publishers now offer electronic versions of academic books alongside print; as Jubb points out, libraries are increasingly opting for these for a variety of reasons (Jubb, 2017).

At the same time as the commercial world was seeking an e-book platform, scholars were experimenting with more flexible, interactive, interwoven formats, exploiting new theories and technologies around hypertext. In the early days of humanist engagement with digital tools, the printed book, it was suggested, was too linear to represent new forms of thinking about text; only computerized hypertexts could represent new scholarly concepts. However, in the 1990s, when these ideas were taking hold, the practical problems of realizing them computationally meant that few actual products appeared, and those that did were often short-lived because of cost, rapidly-moving technologies and low uptake.

Electronic editions and digital imaging projects

Scholarly editions are a particularly complex category of books, and as such may offer some interesting models for all kinds of academic books of increasing functionality, and for new kinds of projects that develop scholarly outputs of differing types and scales. Computers have been used to prepare and analyze texts and sources for the last two decades, and to present the resultant editions. One huge advantage is the almost limitless capacity of digital technology for including or linking to primary sources. Editors of works that occur in multiple manuscripts (the Bible, Chaucer, various classical and medieval texts for example) have, over centuries, evolved a shorthand for presenting the evidence of the multiple texts in constrained print book form, with the choice of a 'base' text to present in full, and then the use of various kinds of sigla to represent where and how variant texts diverge from the base form. Print editions of primary sources are miracles of ingenuity in the use of the page, with apparatus, notes, variant readings. etc., but the limitations of printing, and copyright issues, have meant, for example, that images of

the manuscript could rarely be presented along with the transcriptions, variants and analyses. However, editing in the new media releases these constraints, and images of all manuscripts of a text, with full transcriptions and apparatus can be presented alongside the text itself. This has some interesting consequences: 1) editing projects are often much larger than hitherto, given that many more witnesses can be included, and this has led to more collaborative editing, with large teams, often over considerable distances, being responsible for a project; 2) some electronic editions are produced by publishers, most are not; 3) some editions have print versions as well as electronic editions or accompanying archives; 4) there has been intense debate over whether the products of the many online editing projects are editions or archives; 5) in the large teams necessary to produce the editions, it is difficult to apportion individual credit for promotions and career advancement. Electronic editions are of huge value to those who create them—otherwise, why would they expend so much time and resource on their production? But there is a degree of disquiet about the electronic format as opposed to print for a number of reasons, as follows.

Electronic editions are endlessly mutable and can change from one day to the next; this is claimed as a benefit by many as errors can immediately be corrected, but it is seen as a major disadvantage by others who have concerns about the stability of the scholarly record, something that is not in question with the printed book (and see below for issues of digital preservation). One large scholarly editing project (possibly the world's largest), Oxford Scholarly Editions Online (OSEO), is making available online existing print editions published by Oxford and many other publishers. The editorial board of the project had long and hard discussions about how to deal with errors and corrections in existing works, and the decision was made to produce the editions exactly as they existed in print, even if they were known to contain errors. Where possible these errors have been annotated, but it was more important to be true to the originals than to correct them. This of course is not just a problem with editions, but with any text delivered in digital format. Version control and fixity are key concerns.

Sondheim et al (2015) summarize many of the views of scholars about the benefits of the new media, who employ a 'rhetoric of digital improvement on the printed page,' and they quote Robinson, who asked in 2010 'Who would publish a scholarly edition in print, now that the digital medium exists?' But despite the many advantages of digital editions, they have not replaced print altogether. Many readers do not either want or need the mass of evidence that is available in the digital forms; they just want to read the text. There is, too, the problem alluded to above, the stability of reference. The preservation of the digital formats is also still a concern: more on this below. And despite much research into screens and interfaces, a well-produced printed page can present complex information in a format that is both comprehensible and aesthetically pleasing. This, of course, is vital to all scholarly works, but it is particularly important in the presentation of editions, where there can be several layers of editorial commentary on each page. One claim made for large-scale online editions that are much more like archives is that every reader can create his or her own edition, but there are very few readers who want or need to do that. Most are more than satisfied with a print or e-book edition, produced by trustworthy scholars, so that they can interact with a reliable text with appropriate additional materials.

There have been a number of influential projects in classical studies that have developed tools, techniques, metadata structures that feed into considerations of new forms and formats of publications. The earliest and possibly best-known is the Perseus Digital Library at Tufts University which has been in existence for a little more than 30 years, through many generations of hardware and software, and now contains a large corpus of Greek and Roman texts and artefacts, as well as materials from other periods. Digital research and digital publication have transformed the field of papyrology, the study of ancient documents. The Documentary Data

Bank of Papyrology at Duke University in the US is more than 30 years old, and gives access to Greek and Latin documents written on papyrus, ostraca, or wooden tablets gathered from all over the world.

Great advances have been made in the ability to read and publish ancient documents using new scientific methods. Some, like the Digital Image Archive of Medieval Music (www.diamm.ac.uk), have used commercial products such as Photoshop to enhance images and reveal hitherto unknown works. Others are using advanced multi-spectral imaging: the Dead Sea Scrolls Project (http://www.deadseascrolls.org.il/) and the Archimedes Palimpsest (http://www.archimedespalimpsest.org/) for example, and damaged artefacts that were once impossible to read, such as the carbonized papyrus scrolls from Herculaneum, can now be deciphered with the aid of techniques such as x-ray phase contrast tomography (Bukreeva et al, 2016).

Enhanced monographs

Scholarly monographs, even the simplest of them, and even in print form, have intricate organizational structures, notes, indexes, tables of content, sections, tables, and/or illustrations. Given this, they are not particularly well served by current e-book reading devices; enhanced monographs might represent better the complexities of scholarly argument than the less functional e-book. Current examples of enhanced monographs range from monographs or collections that have a print instantiation and an OA version on line, presented in such a way as to permit and encourage annotation, commentary and blogging from a wider community, to highly complex multimedia presentations with interwoven text, images, and time-based media. Two examples of the former are the second edition of *Debates in the Digital Humanities* and Kathleen Fitzpatrick's *Planned Obsolescence: Publishing, Technology, and the Future of the Academy*. We offer some examples of the latter below.

An early experiment in enhanced monographs was the Gutenberg-e program that ran for ten years from 1998 and received around $1.7 million dollars of funding from the Mellon Foundation. The project was a collaboration between the American Historical Association (AHA) and Columbia University to develop and legitimize new modes of historical scholarship, and to prove a business case for doing so. The program was judged a failure from the business perspective (see Seaman and Graham, 2012), and 'none of Gutenberg-e's stakeholders considered as their primary objective determining how to create something that scholars actually wanted to read and use'. However, many of the individual monographs themselves have been highly successful in demonstrating the power and possibilities of new developments. As Seaman and Graham point out, 'some of the Gutenberg-e authors, in close collaboration with editors and technologists, gave us a brief glimpse of a different future' (282). See for example Lowengard (2006) and Kirkbride (2008) both of which have made excellent use of the digital technologies, and produced something that would not have been possible in printed form. However, Gutenberg-e was an expensive experiment that was not, and never could be scalable, given that not all monographs, extended or otherwise, are supported by large grants from major foundations. Nevertheless, it was highly valuable for the lessons learnt.

In order to encourage projects that *would* be scalable and would develop infrastructures for monograph publishing, the Mellon Foundation has funded a number of projects over the last two years to develop capacity in the US; some $10 million has been disbursed to 21 projects. A

report by John Maxwell and his colleagues at Simon Fraser University (Maxwell et al, 2017) analyses 13 projects funded by Mellon in 2014 and 2015 that are intended to inject capital into change the monograph landscape in the US. Maxwell et al identify three areas of crisis in monograph publishing in the US, which are probably also applicable to the UK situation. These are an economic crisis, a 'first book' crisis, and an innovation crisis. The third, the innovation crisis, presumes that the monograph is stuck in an old-fashioned print-based groove and has not, unlike journals, taken full advantage of all that the digital has to offer (though we would query whether the majority of journals have taken advantage of innovative digital forms either). One of the Mellon's aims in funding the new program is to 'incorporate modern digital practices into the publication of scholarship in the humanities and ensure its dissemination to the widest possible audience. Does this, however, necessarily imply that the monograph needs to be enhanced?   And are 'modern digital practices', whatever they may be, and wide dissemination necessarily the same thing? Humanities scholars are in fact well versed in modern digital practices, and the use of digital resources is, according to Sutherland (2017) 'altering the contours of humanities scholarship'. But the results of such new tools and techniques does not necessarily yield new forms of output: monographs and journal articles are still the preferred choice of most authors and readers, whether they appear in print or electronic form.

Some examples of enhanced monographs

New York University Libraries and NYU Press are in receipt of a Mellon grant of over $750,000 for their Enhanced Networked Monographs program which will bring together communities of readers through commentary and annotation. Publications will be part of a semantic network that offers precise and relevant discovery of concepts within each work, among other functions. The corpus of monographs to be enhanced includes backlist books from NYU Press and its project partners, University of Michigan Press and University of Minnesota Press, and new books from NYU Press, though as yet there are no precise details of titles.

Manifold Scholarship, another Mellon-funded project, is a partnership between the University of Minnesota Press and the City University of New York's GC Digital Scholarship Lab to create enhanced networked monographs. Manifold Scholarship, according to Maxwell, 'is meant to be a hybrid, producing a book but also hosting the iterative discourse contextualizing the book'. A good example of this is the *Debates in Digital Humanities* volume from Minnesota, discussed above, which is made available in an Open Access networked version for commentary and interaction. Other forms of enhanced monographs situate a text within a network of non-textual materials, for instance, *Enchanting the Desert,* by Nicholas Bauch, intended as one of the first products to be developed under Stanford University's Mellon-funded initiative for the Publishing of Interactive Scholarly Works. This interactive work is a book-length examination of Henry Peabody's 1905 slideshows of the Grand Canyon, which creates a digital prototype for studying cultural and geographical history.

There were two interesting, and very different, enhanced monographs produced by Oxford University Press in 2015. The first is *The Ethics of Suicide* by Margaret Pabst Battin (Battin, 2015). The print publication is a condensed version which is connected to the online instantiation of the same book using QR codes, which in turn links to online versions of primary sources, or to library catalogue records of print sources, as well as interactive features that allow readers to submit corrections, suggest additional sources, and discuss the issues covered in the

book. The digital archive version of the book is produced as a blog, with the full text of the book freely available, plus extensive supporting material. The production of this work resulted from a close collaboration between the author, the Press and the University of Utah library. The second is *Composition in the Digital World: Conversations with 21st Century American Composers* by Robert Raines (Raines, 2015) which features in-depth interviews with leading composers of contemporary classical music and explores the impact of digital technology on the creative process. Produced and sold as a printed book, OUP have also made available a website where each of the 28 chapters has links to the composer's web page, as well as a whole range of sources: audio, video, scores, Youtube links, and interviews.

In archaeology, the primary source materials are physical places and the objects of material culture that are discovered there. So for archaeologists, their scholarly outputs are likely to be enhanced with photographs, maps, site plans, drawings, GIS, and scientific data of many different kinds. While books and articles interpreting that data have always been, and still are, of vital importance, the digital has been paramount in enabling scholars to incorporate various kinds and formats of data into the arguments and interpretations. Digital archaeology, claims Morgan, represents an exciting platform for the work of archaeologists, not only through publications or blogs, but also through digital augmentation of archaeological sites. She points out that digital archaeology moves so fast, if she were to write a book about it, it would be outdated by the time it was published. Digital media is therefore essential. (*Archaeology and Art History symposium report*, 2016).

Art historical research has been enhanced by the availability of good quality online sources such as ArtStor, and there are also innovative digital art historical publications appearing, such as the Getty's Pietro Mellini *Inventory in Verse, 1681*, released in 2015, which presents high-resolution images of the manuscript, an Italian transcription and an English translation, essays, and commentary.[3] Through the Digital Art History initiative, the Getty Foundation is providing support that allows art historians to explore the opportunities and challenges presented by new technologies. There are many examples that one could cite of online resources in art history, but these tend to be more akin to databases and catalogues than monographs. The (print) monograph is still largely favored by art historians for a number of reasons: the quality of reproduction of images and their placement in relation to commentary; rights to images which are harder to secure for online publication; the enduring popularity of art books for a wider public.

In musical scholarship, the monograph is limited in its ability to represent, on the one hand, the printed sources of music under discussion, and on the other hand any sense of music as sound. We discuss above the OUP experiment in presenting mixed media resources in association with a book on composition; another promising example presents the complex first editions of Chopin's published output: there are now three major linked online resources for these, all developed under the direction of Professor John Rink (http://www.chopinonline.ac.uk). In 2010, Rink and Christophe Grabowski published the *Annotated Catalogue of Chopin's First Editions*, the most ambitious and comprehensive research ever carried out on these works (Grabowski and Rink, 2010). Rink had already begun work on the Chopin First Editions Online (CFEO) resource, with the aim to present as many of the editions as possible in high quality digital form. 5,500 images from more than twenty libraries are available in the edition, and Rink also conceived of the Online Chopin Variorum Edition (OCVE), a diachronic view of Chopin's works. The *Catalogue* is a major work on scholarship in print, and its conversion to digital format, and its integration with CFEO and OCVE have

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[3] http://www.getty.edu/research/mellini/ . Accessed 1 July 2017.

created a wealth of content for both scholars and performers which could never have been achieved in print format.

In digitizing history, one of the great UK achievements has been the Old Bailey Online (https://www.oldbaileyonline.org) and the various projects that have adopted its robust methodologies, for instance, London Lives 1690-1800: Crime, Poverty and Social Policy in the Metropolis (https://www.londonlives.org); Connected Histories: British History Sources, 1500-1900 (http://www.connectedhistories.org/). Connected Histories now federates search across 25 historical datasets. Are these all monographs? Probably not. But many of them are long-form publications which took considerable original research to achieve, and which could not have been published in book form; they are heavily used. Old Bailey in particular has had considerable impact in the academic and wider communities: Old Bailey Online material formed the basis of BBC1's hugely successful series *Garrow's Law*, which ran for three series between 2009 and 2011, and won the Royal Television Society Award for best drama. It is listed as a key genealogical resource by many archives, for example in the Newcastle Local Studies Genealogy Guide. However, the federating of resources in Connected Histories is not without problems—some of the connected databases are protected by firewalls, so are inaccessible to some users.

Enhanced monographs offer exciting new ways of presenting scholarship, especially in areas where integration of or links to mixed media data is a crucial part of an argument, or where the presentation of large-scale primary sources is a benefit. However, these kinds of monographs are relatively few in number, compared to those which appear in more conventional print or electronic formats, they are costlier to produce, and they require even more input from already hard-pressed scholars. Costly and time-consuming individual projects may be possible to develop with large research grants, and can be of great scholarly benefit. But this is not a scalable model. Where there does seem to be potential for both scalability and innovation is in the infrastructure developments funded by the Mellon Foundation to provide stable and secure platforms for digital scholarly works, for example the University of Michigan Press collaboration with the university presses at Indiana, Minnesota, Northwestern and Penn State to build workflows and infrastructure using Hydra/Fedora, a robust and flexible technical framework and repository system.

Some of the initiatives discussed here are developing new platforms and workflows for digital book production, in partnership with university presses and libraries. Publishers who are currently dealing with producing monographs with a range of print and electronic outputs (Reader, smartphone, tablet versions, etc.) have a different set of challenges, and are having to invest in new and complex (and costly) workflows to allow them to publish across multiple channels from the digital files. Publishers have had to move away from a paradigm in which their business was to produce print and embrace the production of content that may take many forms. This is no easy task. The de facto standard is to use XML, but the DTDs needed for a large publisher dealing with multiple subject areas with different requirements can be large and unwieldy. Output requirements change constantly as the hardware, software and operating systems change, and though XML is a standard, not all instantiations of a standard are compatible or interoperable with each other. Problems are frequent: a recent scholarly editing project developed by an academic team transcribed all its text using a well-documented TEI DTD, then handed the files to a major UK university press to produce a print version. After two years, the press still had not worked out a way to handle the TEI files and suggested to the editor that perhaps the solution was to print out the transcriptions and have them rekeyed.

New digital developments

Publishers are increasingly experimenting with new ways of delivering content in long and short forms. The Cambridge University Press Cambridge Elements publishes original, concise, authoritative, and peer-reviewed scholarly and scientific research works, organized into focused series edited by leading scholars, and providing comprehensive coverage of the key topics in disciplines spanning the arts and sciences. These are regularly updated and developed from the start for a digital environment to provide a dynamic reference resource for graduate students, researchers, and practitioners. The works on offer are 20,000-30,000 words long (40 to 75 pages), and are available in online, onscreen, and print versions.

One of the UK's newest university presses, UCL Press (http://www.ucl.ac.uk/ucl-press), was conceived of from the start as open access and is engaged in some innovative digital developments. In partnership with the Academic Book project, UCL Press have built a new online publication platform, BOOC: Books as Open Online Content. The format consists of a living book that is hosted on a browser-based platform, and material includes traditional content such as reports and presentations alongside non-traditional genres such as videos, presentations, blogs and Storifys.

Liverpool University Press has recently developed *Using Primary Sources* (https://liverpooluniversitypress.co.uk/pages/using-primary-sources), an open access teaching and study resource that combines rare archival source materials with high quality peer-reviewed chapters by leading academics. Covering major themes within the medieval, early modern and modern periods, such as religion, ideas, conflict and class, this provides students with the opportunity to examine rare and original material in detail on their computer, tablet or phone as well as learn how they can integrate the source material in their own written work.

Culture Machine Liquid Books

(http://www.openhumanitiespress.org/books/series/liquid-books/) is a series of experimental digital books published by Open Humanities Press under the conditions of both open editing and free content. Users are free, nay encouraged, to annotate, tag, edit, add to, remix, reformat, reversion, reinvent and reuse any of the books in the series. The most interesting results of such open editing and writing are 'frozen' and published by OHP on the main Culture Machine site as new versions of volumes in the Liquid Books series in their own right. See, for example, *Photomediations: An Open Book*. This series has been set up to explore entirely new ways of writing and publishing and to expressly facilitate experimentation.

In a report commissioned by the Project, O'Sullivan (2017) examines several highly innovative new developments that push at the edges of what we might call an academic book. For example, I ♥ E-Poetry (http://iloveepoetry.com), a knowledgebase of short-form scholarship on digital poetry and poetics. The initial concept was to read and write 100 words a day about a new piece of born-digital literature. This now contains approximately 650 posts, totalling some 195,000 words--more than enough content to comprise traditional perceptions of what constitutes a monograph. Furthermore, while the entries are short form, they are critical and interpretive, and present new meaning on a consistent theme. This might be categorized as a

multi-authored monograph. This has grown over six years from a personal blog by a single scholar and is expanding its coverage of electronic literature through partnerships and collaboration with electronic literature scholars and projects from around the world.

O'Sullivan points out that one of the great affordances of digital modes of publication is that they allow us to represent knowledge in new ways, an advancement that facilitates novel interpretation and representation. *Mapping the Catalogue of Ships* (http://ships.lib.virginia.edu)*, for example, developed at the University of Virginia, illustrates how such an affordance can make complex textual hierarchies more intuitive to readers, demonstrating how the arrangement of the 250-line catalogue of the leaders of the Greek forces and the number of their ships listed within 'Book Two' of the *Iliad* corresponds to the natural geography of Greece. *Mapping the Catalogue of Ships* presents an original contribution to its field and the fact that it necessitated digital publication does not detract in any way from its scholarly value.

Infinite Ulysses (http://www.infiniteulysses.com), a crowdsourced annotated edition of James Joyce's multilayered novel, shows how edge cases, which push at the boundaries of what we understand a book to be, might include 'community books', projects wherein new knowledge and meaning is created, but through the annotations of the crowd. What is interesting about *Infinite Ulysses* is that the entirety of the project's value is crowdsourced. This is unlike various scholarly collections which have included commenting and annotation features alongside the new scholarship they present; *Infinite Ulysses* is taking old material, and giving it renewed significance through open collation.

Produced by Dene Grigar and Stuart Moulthrop, *Pathfinders* (http://dtc-wsuv.org/wp/pathfinders/) documents a selection of early born-digital literature. The project emphasizes pre-Web hypertextual works from between 1986-1995. *Pathfinders* looks to document the experience of this first generation of electronic literature by recording interactions with the authors of the works, as well as traversals by readers interacting with the pieces. In addition to the audio-visual materials, Grigar and Moulthrop have written a print monograph, *Traversals* (MIT Press), with close readings of these works. Grigar describes *Pathfinders* as the methodology, and *Traversals* as a process of that methodology. This project is an interesting example of how edge cases interact with more traditional forms, being both resource and insight at once.

The Virtual Paul's Cross Project (vpcp.chass.ncsu.edu/) is defined as an 'evidence-based restoration' of the north-east end of Paul's Churchyard in November of 1622. The Project was designed to investigate public preaching in early modern London, enabling the experience of a Paul's Cross sermon as a performance, as an event unfolding in real time in the context of an interactive and collaborative occasion. It uses architectural modeling software and acoustic simulation software to give access experientially to a particular event from the past – the Paul's Cross sermon John Donne delivered on Tuesday, November 5th, 1622. This is long-form original research that could have been delivered in no other way.

Non-textual PhD theses

There have been some recent experiments in non-textual PhD theses; while most theses are still produced and submitted in print form, this is not necessarily the most suitable format for practice-based disciplines, or those dealing with material culture. A research project carried out on the British Library's EthOS service by Manton (2016) found a growing trend for researchers

to include multimedia and non-text research outputs in their theses. A workshop organized by the British Library's EthOS team explored how PhD theses might be able to manifest as knowledge that is not necessarily written, and to discuss how multimodal (mixed media) methods could develop an argument within PhD research, and the subsequent difficulties in submitting non-textual work. The participants came mostly from non-textual subject areas, with a preponderance of archaeologists, and they discussed a whole range of multimodal projects, including 3-D reconstructions, archaeological games, and visualizations. Problems of access, storage and long-term survival were also touched on, as were the issues around examination and accreditation (Foxton, 2016).

Preservation

With the wide variety of forms and formats of the academic book that we have outlined here, a key consideration must be long-term preservation of the digital versions. As the Digital Preservation Coalition points out:

> The provision of long-term, permanent access to eBooks that have been licensed is ill-defined, and ownership of the responsibility for the preservation of different large categories of digital artefacts that fall under the rubric of eBooks is not clearly established. Nor are the costs for carrying out the preservation and establishing sufficient permanent funding to meet those costs. (Kirchhoff and Morrissey, 2014, 2)

In the print world, libraries and archives are the loci of preservation of content, and they retain that role in relation to digital media. But other players also come to the fore: publishers offering Gold Open Access, for example, need to maintain a long and ever-growing backlist of publications and will have enduring responsibility towards them, especially since these represent a continuing income stream, and there are a number of commercial and not-for-profit organizations providing a wide range of services in preserving publications and complex research data. For national libraries, the long-term preservation issues of the national written record, now extended in many countries to the legal deposit of non-print materials, pose particular problems. The sheer volume and diversity of possible acquisitions, and the responsibility to harvest national web sites, is a major undertaking, and in the UK, the Legal Deposit Libraries have implemented a shared technical infrastructure for non-print legal deposit, based on the Digital Library System first developed by the British Library that ensures long-term survivability and access, and the libraries have been working with Portico (see below) on a range of preservation issues and possibilities.

Print is probably a better medium in terms of long-term preservation, though we must not forget that print needs preservation too, but the outreach of online publications hugely outweighs the dissemination levels a paper book can achieve. These issues, which are being debated throughout the library and publishing communities, highlight the complex relationship between preservation and dissemination, engendering the question of how we can successfully deal with both in the long term, as it is increasingly clear that we must.

Digital media are at risk through media, hardware, software and format obsolescence, through loss of context if the metadata is inadequate, and from the sheer volume of digital material. Preservation therefore involves a rich set of technical and administrative processes that

need to be managed within a framework of clear guidelines and policies. Because digital data is so complex and varied, and there are so many formats and standards, any one institution will need to adopt a number of different methods which are well-explained and well understood in the digital preservation community; see the various documents and guidelines published by the organizations discussed below. A key and critical issue in digital preservation is authenticity: the maintaining of a resource's integrity and meaning, even though it may have been transferred between media and hardware several (or indeed many) times. The technical metadata attached to the object to be preserved will, if properly used, guarantee that a chain of custodianship has been maintained, and there are also technical methods for ensuring authenticity such as the use of checksums.

To assist with the technical and policy needs of repositories, an international collaboration has established a set of criteria bundled together in the Trusted Repositories Audit & Certification (TRAC) through which repositories can gain levels of accreditation as Trusted Digital Repositories. There are also many projects and services for both giving advice on preservation and offering preservation facilities: the Digital Preservation Coalition (http://www.dpconline.org/); the Digital Curation Centre (http://www.dcc.ac.uk/); OCLC (www.oclc.org/); Portico (http://www.portico.org/digital-preservation/); LOCKSS (www.lockss.org); national libraries; national archives; commercial organizations concerned with preservation. The European Commission has funded many projects in digital preservation through its various ICT programs.

Portico, a US not-for-profit preservation archive is a market leader in academic preservation and is experiencing rising demand for its services; demand for preserving e-books is on the increase, and they also have requests to preserve complex historical data. Portico introduced its E-Book Preservation Service (www.portico.org/digital-preservation/services/e-book-preservation-service) to the publishing community in 2008 and in 2011 library participation began. CLOCKSS (https://www.clockss.org/clockss/Home), another US not-for-profit, has also seen a steady stream of both e-journals and e-books deposited into its internationally distributed network of archives. CLOCKSS uses LOCKSS (Lots Of Copies Keep Stuff Safe), an open source digital preservation system developed at Stanford University, and in 2016 signed key contracts with Cambridge University Press, Emerald Group Publishing and IOPP Publishing, UK. Both Portico and CLOCKSS are now working on dynamic data models for ingest as well. Kate Wittenberg points out that 'publishers are handling more distributed, dynamic objects as part of their publications, with content increasingly based on data rather than text, so establishing the best preservation approach will be crucial' (quoted in Pool, 2016). In the UK, Arkivum 'stores a dizzying array of content for organizations in higher education as well as healthcare, life sciences and heritage' (https://arkivum.com). They have contracts from JISC in the UK, and many UK universities, the New York Museum of Modern Art, The Tate Gallery, among others, and they handle a very wide range of data types. See Pool (2016) for more details of Portico, CLOCKSS and Arkivum.

There are also important initiatives where publishers and libraries are working together to ensure that published materials at particular risk are safe. These began with journals, but are now being employed for books. The Koninklijke Bibliotheek (KB) in the Netherlands has been an international leader in this, with the establishment of their e-Depot, built using robust standards and metadata that facilitate communication between systems; it is offered as an international service, and major academic publishers have signed up as partners. The KB and Portico are partners in the Safe Places Network (Ras, 2009). They have defined a set of conditions which trigger action to preserve content which a publisher is no longer able to maintain for a variety of reasons.

It is axiomatic that it is only possible to preserve reliably that which you can control. One problem with enhanced monographs and other complexly interlinked digital publications and resources is that they often connect to many outside sites and organizations, and links are sometimes broken. The use of the Digital Object Identifier is addressing this problem, but not all resources are identified in this way, especially in the humanities, and we have also found instances of broken links even where this is employed. The other problem that is encountered is that of stability and fixity. We discuss above the issues of fixity in relation to electronic editions, but this is also a concern with other kinds of complex networked data. The possibility for constant additions, updates and modifications means that it can be difficult to establish firmly a version of record; hence the importance of reliable metadata systems to keep track of all the processes a resource goes through during its lifecycle. The other issue is the stability of the data that is linked to: even if the links continue to work, there is no guarantee that the resources themselves will maintain their integrity.

As the books of the future become ever more networked and multimodal, the preservation problems will increase. Innovation is to be welcomed in this area, but this brings with it the problems of preserving access mechanisms which may offer very different sets of functionalities alongside the underlying content, as is the case with the examples above. Maintaining functionality in this way, especially when the original developers are no longer managing the resources, is likely to be technically challenging and costly, and it may be that only the content can be preserved, together with metadata that describes the functions of the original object, which could be re-engineered in the future if the need arises. While we welcome the infrastructure developments that unify and standardize platforms for the delivery of enhanced monographs, we must never lose sight of the possibilities offered by the new and experimental, despite the potential problems these may bring with them. The other issue is the contentious one of whether all digital data *should* be preserved. Libraries and archives have always had to make difficult decisions about retention and deaccessioning of content; some pragmatic decisions may need to be taken.

The Digital Preservation Coalition's strapline is 'Our digital memory accessible tomorrow'. Digital preservation is one of the most important challenges facing the academy (and indeed the wider world) as we move further and further towards digital and open content. In 2015, the winner of the Academic Books That Changed the World competition was Darwin's *On the Origin of Species* (Publishers' Association, 2015). It is vital that we think about how many of the books we are publishing this year as enhanced monographs and in open access will still be accessible and influential 150 years hence: preservation remains a key and pressing issue for digital academic books.

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