

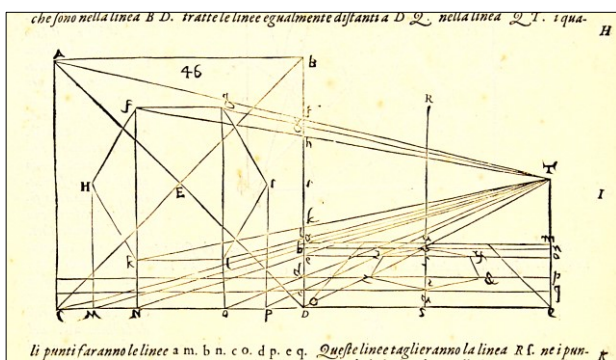


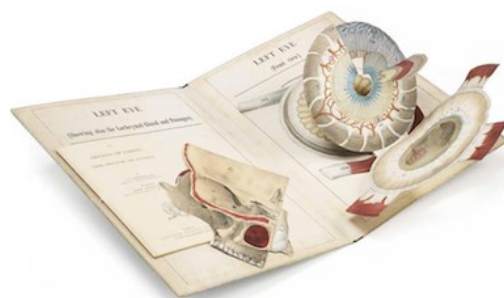
<b>Section A</b>		
<b>Institution:</b> University of St Andrews		
<b>Unit of Assessment:</b> UoA 32: Art and Design: History, Practice, and Theory		
<b>Title of case study:</b> Thinking 3D: Reinterpreting three-dimensional illustration in and beyond the early modern printed book		
<b>Period when the underpinning research was undertaken:</b> 2010 - 2019		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b> Laura Moretti	<b>Role(s) (e.g. job title):</b> Senior Lecturer	<b>Period(s) employed by submitting HEI:</b> 01 October 2010 - present
<b>Period when the claimed impact occurred:</b> 2015 - 31 December 2020		
<b>Is this case study continued from a case study submitted in 2014?</b> N		
<b>Section B</b>		
<b>1. Summary of the impact</b>		
<p>This cross-disciplinary initiative led by Dr Laura Moretti, School of Art History, took up the theme of illustration in early modern printed books (ca.1500-1700). The research considered these objects as key sources for the spread of three-dimensional (3D) representation, moving from their origins to their influence in areas from fine art to architecture, from engineering to scientific enquiry. As a result, audiences, including the public, museum and library professionals, and non-specialist academics, have gained an enhanced understanding and awareness of the cultural heritage encompassing early modern printed books. In doing so, Moretti's research has allowed material that is often deemed obscure and difficult to display to be shown in highly successful exhibitions and to be appreciated and embraced by audiences that would not normally engage with it. In particular, the research has:</p>		
<ul style="list-style-type: none"> <li>• <b>Created new forms of curatorial engagement</b> (e.g. exhibition planning, approaches to display, and material conservation), with 12 top-rank institutions producing exhibitions inspired by Moretti's work.</li> <li>• <b>Increased public understanding</b> of early modern printed books and their cultural significance, with exhibitions and events which saw the participation of over 150,000 people, in addition to an approximately 50,000-strong online community.</li> <li>• <b>Engaged new audiences, including scientists, artists, and children</b>, through 25 events that facilitated cross-disciplinary knowledge-exchange.</li> </ul>		
<b>2. Underpinning research</b>		
<p>Early modern illustrated books can seem quite remote objects – dusty and erudite volumes to be pored over only by the most specialised of scholars. The research sought to bring such materials to life for the public and for academic audiences beyond period specialists. It emphasised how the development of 3D representation within the books' pages reveals these objects to be at the heart of the development of artistic and scientific cultures right up to the present day. The research for this project has been carried out in two main phases, moving from Moretti's work on the Renaissance polymath Daniele Barbaro (2010-2016) to an interdisciplinary and multi-institutional investigation into 3D representation (2015-2020). Research in phase 1, led by Moretti, resulted in sole authored essays, a co-edited essay collection, and an Open Access scholarly resource containing a census of Barbaro's works [R1-R3, R5]. Research in phase 2 involved broader collaborations, with Moretti co-editing the key publication and an Open Access resource containing 57 essays by 48 scholars, including 5 St Andrews School of Art History academics [R4, R6].</p>		



Phase 1 (2010-16) centred on Barbaro (1514-70), a key figure in the development of perspectival and architectural illustration. Developing from her research on the architectural treatise by Vincenzo Scamozzi (1548-1616) [R1], Moretti realised that the illustrations in Barbaro's works (cf image on the left from *La pratica della prospettiva*, 1569, showing a hexagon in perspective) had been relatively neglected and that closer attention to these sources could demonstrate

significant links between the arts, the sciences, and the illustrated book. Addressing this issue, Moretti co-edited a volume on Barbaro's life and work [R2] and led a Leverhulme Trust International Research Network in partnership with the Biblioteca Nazionale Marciana, Venice (BNM) and the Centre for the Études Supérieures de la Renaissance, Tours (CESR) [R5]. In 2015 Moretti developed these ideas into a co-curated exhibition (with Susy Marcon, Rare Books Librarian, BNM) considering Barbaro's work in the context of literature, science, and the arts of his time [R3]. This phase showed i) how research into 3D representation in Barbaro's work allowed a broader investigation far beyond artistic areas, and ii) how this broadening of investigation to scientific and other practical uses for 3D representation could provide means to effectively display books usually thought to be too specialised for public displays.

Phase 2 (2015-2020) stemmed from discussions between Moretti and Daryl Green (then Rare Books Librarian at the University of St Andrews), about how to develop these research findings. In 2016, the pair launched *Thinking 3D*, a project that considered illustrated books produced between the 15th and the 21st century as tools to think about how three-dimensionality has affected fields from fine art to the sciences to engineering, architecture and industry (see image on the right from G. J. Witkowski, *Human Anatomy and Physiology*, 1844-1923, representing a human eye deconstructed into multiple paper layers). The remit allowed book and art historians to engage with specialists in these areas, fostering cross-disciplinary conversations and attention to illustrated books. These concepts, set out in a book co-edited by Green and Moretti, include a co-authored essay on the history of 3D representation told through illustrated books [R4]. The Open Access website, co-curated and maintained by Green and Moretti, brought together specialists from across periods in art history, visual studies, history of science, medicine and architecture, to publish essays that communicate their disciplinary perspectives of 3D representation in a rigorous and widely accessible form [R6].



### 3. References to the research

#### R1 & R2 - single-authored essays in peer-reviewed books of international significance:

[R1] L. Moretti, "Il concetto di proporzione nell'*Idea dell'Architettura Universale* di Vincenzo Scamozzi (1615)", in S. Rommevaux, P. Vendrix, V. Zara (eds), *Proportions. Science, Musique, Peinture & Architecture*, Turnhout: Brepols, 2012, 425-42. ISBN: 9782503542218.

[R2] L. Moretti, "Ancora sulla 'scenographia': la parte quarta de *La pratica della prospettiva* di Daniele Barbaro (1568-69) e i manoscritti preparatori conservati presso la Biblioteca Nazionale Marciana di Venezia", in P. Caye, F. Lemerle, L. Moretti, V. Zara (eds), *Daniele Barbaro 1514-1570. Vénitien, patricien, humaniste*. Turnhout: Brepols, 2017, 221-51. ISBN: 9782503575513.

#### R3 & R4 - co-edited books including contributions by 25+ international scholars:

[R3] S. Marcon, L. Moretti (eds), *Daniele Barbaro (1514-70). Letteratura, scienza e arti nella Venezia del Rinascimento*, exhibition catalogue, Cornuda (Treviso): Antiga, 2015, with essay and 7 catalogue entries by Moretti. ISBN: 9788897784876

[R4] D. Green, L. Moretti (eds), *Thinking 3D. Books, Images and Ideas from Leonardo to the Present*. Oxford: Bodleian Publishing, 2019. ISBN: 9781851245253.

#### R5 & R6 - online resources including contributions by 50+ international scholars:

[R5] <<https://arts.st-andrews.ac.uk/danielebarbaro/>>. Website of the International Network

*Daniele Barbaro (1514-70): In and Beyond the Text* (01/02/14-31/03/16), PI Moretti, including census of Barbaro's editions and scholarly essays on individual copies (launched 11/15). [R6] <<https://www.thinking3d.ac.uk/>>. Website of the project *Thinking 3D*. Co-curated and maintained by Green and Moretti, includes 58 essays by 48 scholars (launched 10/17).

#### 4. Details of the impact

The research described in Section 2 on 3D representation in and beyond the printed page has resulted in (1) the creation of new forms of curatorial engagement which have changed professional practices in the use of early modern illustrated books; (2) an increase in public understanding of the significance of printed books as a particular form of cultural heritage; and (3) the involvement of new audiences and enhancement of curatorial capacity to design cross-institutional initiatives. These changes have been implemented through three distinct forms of knowledge-exchange:

- Direct collaboration with curatorial staff, with Moretti co-curating 2 major exhibitions: *Daniele Barbaro (1514-70). Letteratura, scienza e arti nella Venezia del Rinascimento* (BNM, between 10 December 2015 and 31 January 2016, extended to 28 February 2016), with S. Marcon; and *Thinking 3D from Leonardo to the Present* (Oxford, Bodleian Libraries, between 21 March 2019 and 9 February 2020), with D. Green, organised to coincide with the 500<sup>th</sup> anniversary of Leonardo da Vinci's death.
- The accredited endorsement and appropriation of the *Thinking 3D* concept by librarians, museum curators and event organisers, resulting in 12 exhibitions in top-rank institutions and 25 public events, with over 150,000 people (public participants) and a wide online audience.
- Publication of Open Access material addressed both to general and specialist audiences.

**1) Creating new forms of curatorial engagement.** The *Thinking 3D* concept was embraced by more than 20 librarians and museum curators, resulting in 12 related exhibitions (2015-2020). Participating partners in the UK, Italy and USA constituted a diverse body of institutions, representing a wide range of disciplines: the Bodleian Libraries, Oxford (BOD); Biblioteca Nazionale Marciana, Venice (BNM); University of St Andrews Library; Centre for Research Collection, University of Edinburgh; Royal College of Physicians, London (RCP); Royal College of Physicians and Surgeons, Glasgow; Christ Church, Botanic Garden, Ashmolean Museum (AM) and Mathematical Institute (MI), Oxford; and Annette and Irwin Eskind Family Biomedical Library, Vanderbilt University, Nashville (VAN). Each partner institution supported the project and fully financed the exhibitions and related events. The librarians and museum curators, incited by the *Thinking 3D* concept and the activity undertaken by Moretti and her co-curators in the main BNM and BOD exhibitions, explored new curatorial practices and new approaches to display methods. One curator, the librarian at the RCP, London, praised "*the space for thought and encouragement of creativity afforded by participating in Thinking 3D*" [S1], which allowed librarians and museum curators to develop in a range of new directions, including:

**- Contextualising institutional library and museum collections in new ways.** Particular importance has been placed in establishing meaningful relations between historical objects and cutting-edge technologies. The BNM exhibition included a wide horizontal screen containing the digitisations of all the books and manuscripts on show (approximately 30 items), so the visitors could virtually leaf through them. The BOD exhibition showcased for the first time in the UK the so-called *Codescope*, an interactive tool that allowed curators to virtually display the Codex Leicester, a manuscript by Leonardo da Vinci rarely exhibited in physical form, giving access to every page of the original document, with translations and animated versions of Leonardo's drawings. The AM and MI curators combined Islamic ceramics, prehistoric carvings and Renaissance prints with virtual reality (VR) technology. Other forms of new curatorial interpretations saw librarians engaging with contemporary art. In the words of its curator, "*the exhibition 'Under the skin: anatomy, art and identity' is the first time the RCP library, archive and museum team has engaged in a sustained way with contemporary art, and it is also the first time in my own career that I have done so*" [S1, p. 2].

**- Reinterpreting institutional collections and exploring new forms of display.** As the VAN librarian stated: "...*the project's intersections between art, medicine, neuroscience, pseudo-science, philosophy, technology, and even theology inspired us to examine, interpret, and develop our collections from new perspectives*" [S2]. The project also incited curators to explore new exhibition techniques and methods, as underlined by the RCP librarian: "*I*

developed an in-house technique for mounting anatomical 'flap diagrams' for long-term display, to show their three-dimensionality to best effect. I also developed a number of animated videos to enable exhibition viewers to understand the objects' structures in more detail" [S1]. As stated by the former director of the BNM: "Even the document restoration activities were ... the occasion for research and in-depth studies such as to connect the analysis of the techniques of material production of books to the cultural climate of the time" [S3, translated].

**2) Increasing public understanding of printed books and their cultural significance.** The sustained engagement with the public lasted for 5 years (2015-20) via 12 exhibitions and 25 events which saw the participation of over 150,000 people, and online resources which communicated our research to a more than 50,000-strong online community.

The **exhibition at the BNM** received broad public attention. It was seen by 37,496 people (visitors) [S4], in addition to 323 people in guided tours by heritage and tourism organisations. The interactive screen allowed visitors to virtually leaf through the pages of the exhibited items, having a more thorough engagement with items normally experienced by looking passively at the individual book openings selected by the curators. As the former director stated: "exhibition criteria have been adopted that satisfy both the needs of teaching, with an effective communication system and an intense program of guided tours, and a more casual use, through multimedia devices with which the public was able to interact directly" [S3, translated].



The **exhibition at the BOD** saw the participation of 166,418 people (visitors) and included 28 school visits for a total of 402 people (students) [S5]. It received reviews across national, local, and specialist publications, for a total reach of over 15,000,000 people [S5]. The *Financial Times* (FT) commented that the curators Green and Moretti achieved an "impressive ... coherence", "conveying depth by drawing [which] makes geometry comprehensible ... and ... transforms three areas of fundamental intellectual enquiry: anatomy, architecture and astronomy" and "Thinking 3D explores territories where words tangle incoherently

and only pictures will suffice" and, finally, "you'll find it full of wonders" [S6]. The **kiosk evaluation reports** [S7] highlighted enthusiasm for the initiative, indicating that 92% of visitors thought the exhibition was 'excellent' or 'good' and 84% considered it 'thought-provoking', praising interpretation and exhibition design for creating an engaging experience; 81% of visitors left with a new understanding of 3D technologies throughout history. The exhibition excelled at giving visitors **a new perspective and provoking reflection on the wide-ranging use of 3D illustration**, as attested by visitor quotes: "even a long time ago books used such intricate paper engineering", "linking gynecological (sic) textbooks, stairway drawings, and black holes. Unbelievable!" [S7(a), p. 4]. **3D-printed shapes** were available at the entrance to help visitors to interact with the displayed books, to improve accessibility and to stimulate children to understand the illustrations presented in the exhibited items (see image above). According to the FT, this "works better than you'd think: by relating vision to touch, it makes us properly aware of all the mental tricks we have to perform, in order to realise 3D forms in pictures" [S6]. The reaction visitors had to the 3D printed shapes particularly stood out in the visitor's comments, several of which were left by children: "Amazing! I love having stuff that you can touch as part of the exhibition" [S5]. Specific **didactic material** was conceived to support teachers during school visits [S8].

80% of the **AM and MI exhibition** visitors felt the VR experience helped them to understand multiple dimensions better, and 57% had never tried VR before. VR was approached by all age groups, with 27% of users over 65 (opposed at 22.2% under 25). As a visitor stated, the experience was "Fantastic, I enjoyed a lot. We need more exhibitions like this one" [S9]. Overall, our website statistics demonstrate steady engagement and sustained growth with 32,548 people (users) engaged in 47,741 sessions with 95,588 views between 1 October 2017 and 6 September 2020 [S10, pp. 1-3]. The **project's pages on social media** have been followed by nearly 16,000 people. Since 2017, the Facebook (FB) page has attracted



approximately 15,000 people (followers) (for comparison BNM: 21,065; BOD: 43,616 on 18/09/20; both major long-running FB institutional accounts) [S10, p. 4]. One of the project's FB page's distinctive features was the **gallery of 30 albums** of books primarily from the Bodleian Libraries, Magdalen College, Oxford and the University of St Andrews Library, each with nearly 100 images, for a total of approximately 3,000 pictures; these albums have been shared online thousands of times (e.g. Catesby's *Natural History of Carolina, Florida, & the Bahamas*, 526 shares [S10, pp. 5-6]). The items presented span from medieval manuscripts to printed books published from the mid-15th to early 19th centuries. Particularly successful were images which showed the objects in their materiality and with their copy-specific peculiarities, not visible in ordinary 'flat' pictures, such as the raised stamps on pages or textures of the materials (see image on the right), appreciating the sense of being in the actual presence of the object.



**3) Involving new audiences and facilitating cross-disciplinary dialogue and cross-institutional collaborations.** As the FT commented, "Thinking 3D is more than just this exhibition" [S6]. The project incited a pan-Oxford season of events: the BOD exhibition was surrounded by a group of satellite exhibitions and supported by a series of conferences, talks and workshops (between 2019 and 2020, total 25 events). Evaluation reports suggest that this approach was welcomed by visitors: 73% reported they have, or would, visit at least one other *Thinking 3D* exhibition, and 1 in 4 intended to see all of them [S5]. Among the highlights was 'Thinking 3D: Library Lates' (12 June 2019), an evening of interactive displays from the cutting edges of medicine and astronomy, dancers interpreting the irregular heart, invisible fundamental particles, DNA origami, and virtual reality, particularly popular with the target audience of under 35s (44% of visitors in this age group). As one visitor underlined, "The way it all has the theme of 3D - so much to take in and think about - very inspiring - good to see & hear about such different perspectives - really enthusiastic and passionate presenters & curators" [S5, p. 11].

The **facilitation of cross-disciplinary dialogue** established collaborative frameworks among academics, and library and museum curators, to design cross-institutional initiatives. "Historians of art, science, letters, the press, librarians, codicologists, restorers have confronted each other over the two-year duration of the project by integrating their specific skills and creating seminars and scientific publications" [S3, translated]. For the event 'Thinking 3D: history of science collections in Oxford colleges' (25 October 2019), 12 institutions arranged displays of their collections, creating a network of exhibitions showcasing items ranging from medieval wonders to modern archives laced together on the theme of the 'history of science'.

Finally, our cross-disciplinary dialogue and cross-institutional collaboration also **resulted in enhanced institutional capacity**; the VAN librarian exemplified this: "the project's intersections between art, medicine, neuroscience, pseudo-science, philosophy, technology, and even theology inspired us to examine, interpret, and develop our collections from new perspectives... This was the first time we had held our own exhibition at this scale, and our events and publicity connected us with potential future partners and prepared us organizationally and technologically for future projects" [S2].

## 5. Sources to corroborate the impact

[S1] Statement by RCP librarian and exhibition curator (08/09/20).

[S2] Statement by VAN librarian and exhibition curator (10/02/20).

[S3] Statement by former director, BNM [in Italian, with English translation] (15/02/20).

[S4] Email communication from press office, BNM (29/02/2016).

[S5] BOD exhibition report (06/07/20).

[S6] Review of BOD exhibition, *Financial Times* (21/03/19).

[S7] BOD exhibition kiosk evaluation reports: (a) June 2019; (b) June 2020.

[S8] Didactic material produced for BOD exhibition.

[S9] AM and MI exhibition evaluation report (06/20).

[S10] Online stats (09/20): (a) Website Google Analytics data; (b) Facebook pages reports.