

JACOPO DE' BARBARI'S *VIEW OF VENICE* (1500) 'IMAGE VEHICLES' AND 'PATHWAYS OF CULTURE' PAST AND PRESENT*

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Abstract

This essay focuses on an iconic and ground-breaking woodcut – Jacopo de' Barbari (c. 1460/70–1516) and Anton Kolb's *View of Venice* (1500) – and an interactive museum installation that I first developed for Duke University's Nasher Museum of Art. The exhibition uses the *View* as a point of departure for the development of multi-media displays about Early Modern Venice and the transfer of knowledge. Adopting Aby Warburg's illustrative terminology, the essay extends understandings of the woodcut, namely its function as an 'image vehicle' and its invention and realization as a product of cultural pathways. This concept, 'pathways of culture', also relates to the digital methods and visualized media used in the exhibition where their application advances a new methodology in art history, just as Aby Warburg did in the early twentieth century. And like Warburg who privileged visual imagery and traced its ideological transmission with his *Mnemosyne Atlas* (1924–1929), the curatorial team of the exhibition uses and systematizes original visualizations to drive the analyses of art, architectural and urban history in new and exciting ways.

Key Words

Jacopo de' Barbari, *View of Venice*, Renaissance Venice, Graphic Arts, Art Historical Methods, Aby Warburg, Digital Humanities.

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Jacopo de' Barbari (c. 1460/70–before 17 July 1516) and Anton Kolb's *View of Venice*, c. 1497–1500, visualized one of the most powerful Early Modern states in spectacular and unprecedented detail (fig. 1).¹ The monumental woodcut was a visual and technological marvel. It embodied geographic as well as metaphoric ideals of Venice and its place in the world at the turn of a new century and demi-millennium. Celebrating a powerful integration of knowledge – artistic and scientific – the bird's-eye view was a material expression of the city and its state. Indeed, its visual claims were echoed by written accounts that waxed poetic over its uniqueness.² Formed from six sheets of paper, each printed on its own exquisitely carved wooden block, the image's reproducibility held tremendous potential for the wide dissemination of its messages.³ A manifesto of Renaissance thought – the *View* was an opportunity to celebrate Venice and amaze the world.

The composite impression reveals the city's elegantly curved form, rising from the Adriatic where people lived, navigated, and experienced urban life in a way that differed from any other place in the world.⁴ Venice's dense urban form

¹ For literature related to the *View*, see: JAY ALAN LEVENSON, *Jacopo de' Barbari and Northern Art of the Early Sixteenth Century*, Ph.D. Diss., New York University, 1978, p. 278–281; JÜRGEN SCHULZ, « Jacopo de' Barbari's *View of Venice*. Map Making, City Views, and Moralized Geography before the Year 1500 », *Art Bulletin*, 60 (1978), p. 425–475; DEBORAH HOWARD, « Venice as a Dolphin. Further Investigations into Jacopo de' Barbari's *View* », *Artibus et Historiae*, 18 (1997), p. 101–111; GISELLE LAMBERT, *Les premières gravures italiennes. Quattrocento du cinquecento. Inventaire de la collection du Département des Estampes et de la Photographie*, Bibliothèque nationale de France, Paris 1999, p. 331–333; GIANDOMENICO ROMANELLI, SUSANNA BIADENE, *A volo d'uccello: Jacopo de' Barbari e le rappresentazioni di città nell'Europa del Rinascimento*, Arsenale, Venezia 1999; CORRADO BALISTRERI-TRINCANATO, DARIO ZANVERDIANI, *Jacopo de' Barbari. Il racconto di una città*, 2 vols., Cetid, Venezia 2000; GERT JAN VAN DER SMAN, « De eeuw van Titiaan: Venetiaanse prenten uit de Renaissance », in ID., *Le siècle de Titien. Gravures vénitiennes de la Renaissance*, Waanders Uitgevers, Zwolle 2003, p. 40–41; SIMONE FERRARI, *Jacopo de' Barbari. Un protagonista del Rinascimento tra Venezia e Dürer*, B. Mondadori, Milano 2006, p. 150–154; BEATE BÖCKEM, *Jacopo de' Barbari. Künstlerschaft und Hofkultur im 1500*, Böhlau Verlag, Köln 2016 (Studien zur Kunst, 32), p. 32–33, 39–50, 428–429.

² In particular, see: BRONWEN WILSON, « Venice, Print, and the Early Modern Icon », *Urban History*, 33 (2006), p. 39–64, in which the author considers the complicity of printmakers in the promotion of Venice, especially within an emerging international market. Natives and foreigners alike wrote laudatory descriptions of the city around the time of the *View*'s publication. Among these were Marin Sanudo, Marc'Antonio Sabellico, Arnold von Harff, Pietro Casola, and Philippe de Commines.

³ This is the subject of another paper in which I analyze the idea of viewing the *View* from both a theoretical perspective as an essay on spatial analysis, and from a practical one in its presentation strategies.

⁴ Select contributions about art and architecture according to Venetian experience include: PATRICIA FORTINI BROWN, *Venetian Narrative Painting in the Age of Carpaccio*, Yale University Press,

gives way to the more than one hundred-twenty islands that come together to form a mosaic of interdependent spaces accessed via bridges and canals (fig. 2). Upon closer view, one can note the individual architectural structures that compose it: every building – private and public – from parish church to monastic complex, sites of government administration and palaces to open squares, some not yet paved, and gardens (fig. 3). The *View* shows the openness of Piazza San Marco, seat of Venice's government and power, flaunting the city's confidence in its ability to withstand threats from potential enemies (fig. 4).⁵ Ships, commercial and military, remain moored near the Arsenal; hundreds of smaller boats appear throughout the interstices of the city.

The *View* captures the distinctiveness of a city built in the middle of a lagoon: men fishing in its channels; the many gondolas moving people and materials through winding canals and out into the lagoon; the celebratory regatta invoking festivals and choreographed events on its waterways. It also highlights Venice's unique architecture.⁶ The church of San Marco, shrine to the city's patron saint, discloses longstanding associations with the East through its majestic domes and decorative details. Ornate palaces face out towards canals, while sculpted wellheads in each square mark the location of fresh water. Moving in closer, even greater detail emerges, including the careful articulation of windows, doors, sculptural details and frescoed façades that disclose an impressive range of artistic vocabulary – physical articulations of the city's multi-cultural and cosmopolitan nature (see VIDEO 1: <<https://duke.box.com/v/Video-1>>).⁷

Only one archival document has been connected to the *View of Venice*.⁸ It records the request by Anton Kolb, a German merchant residing in the city and

New Haven–London 1988; PAUL HILLS, *Venetian Colour. Marble, Mosaic, Painting and Glass*, Yale University Press, New Haven–London 1999; DANIEL SAVOY, *Venice from the Water. Architecture and Myth in an Early Modern City*, Yale University Press, New Haven–London 2012.

⁵ Observers frequently note and question the absence of people in Piazza San Marco despite the fact that human industriousness is indicated elsewhere in the city. It is difficult to say whether there was a particular reason for this. It may simply be artistic license aimed at allowing clear legibility of the urban space and its messages as a site of power and learning (all the more notable for the inclusion of the recently constructed, yet highly sophisticated Clock Tower). Louis Marin suggests that the power of cities is more effectively conveyed in cityscapes that exclude people. See LOUIS MARIN, « La ville dans sa carte et son portrait », in ID., *De la représentation*, Gallimard, Paris 1994 (Hautes études), p. 204–218.

⁶ The visual record of the architectural monuments as they appeared was important. Careful comparison of the first and second state prints indicates a number of modifications, such as the Bell Tower in Piazza San Marco, and discloses the importance of their visual documentation. In addition, most labeling in the image is connected to location, particularly in the case of churches, the winds, and Venice itself.

⁷ Please note that for optimal viewing of the video, it is important to change the quality from 'auto' to '1080' under settings.

⁸ ASVe, Collegio Notatorio, reg. 15, fol. 28r. It should be noted that the Collegio's action is mentioned in the Diary of Marin Sanudo on 31 October 1500; see *I diarii di Marino Sanuto, 1496–*

likely financial sponsor of the project, to Doge Agostino Barbarigo (r. 1486–1501) and the Collegio. In it, Kolb seeks two permissions: first for a copyright on the invention of the image, and, second, for the exclusion of taxes on its sale in the provinces.⁹ The state granted a *privilegio* for four years. While such courtesies had been extended to publishers of books, this is the first given to a published image, implying that the State was fully aware of the image's novelty. The document, a transcription of Kolb's appeal, reveals that the project took three years to complete. In it, Kolb also highlights the image's invention in terms of composition and scale, and notes that it was printed on customized paper, the largest sheets produced in Europe. We also learn that he must set the price at no less than three florins in order to recover the investment.¹⁰ The use of florins instead of the Venetian ducat is curious and may point to an interest in an international market even if the ducat was a higher quality form of currency due to the purity and weight of its gold.¹¹ The six separate sheets would have facilitated sale thanks to their transportability, promoting circulation beyond Venice with the many foreigners passing through the city.

In addition to visualizing the magnificence of the Venetian state and celebrating the skills and inventions of its makers, the *View* may also, albeit subtly, commemorate the Germans and their role in the transmission of knowledge – a knowledge that, combined with Venetian ambition, resulted in such a marvelous work. It bears noting that in the composition, the alignment of Mercury and Neptune is off center, slightly to the left, in order to delineate the two most important sites in the city, Piazza San Marco and the Rialto. But closer examination reveals that their placement does more than that. Mercury, in fact, appears above the Fondaco dei Tedeschi, the warehouse and residential quarters of the German community, along with their church of San Bartolomeo (fig. 5) for which Albrecht Dürer (1471–1528) painted the high altarpiece of the *Madonna of*

1533: *dall'autografo Marciano ital. cl. VII codd. CDXIX–CDLXXVII*, ed. RINALDO FULIN, vol. III, Tip. Visentini, Venezia 1880, col. 1006. For a transcription of the document, see SCHULZ, « Jacopo de' Barbari's *View of Venice* », p. 473.

⁹ CHRISTOPHER WITCOMBE, *Copyright in the Renaissance. Prints and the Privilegio in Sixteenth-Century Venice and Rome*, Brill, Leiden–Boston 2004 (Studies in Medieval and Reformation Thought, 100), p. 32–33. Witcombe asserts that the permission relates only to the tax exemption and not the image itself. However, this is impossible to determine since the document itself is a transcription of the original, and elides clauses in a way that prevents a correct understanding and/or translation. Given the amount of time that Kolb spent articulating the uniqueness of the image, it is difficult to believe that he did not seek a copyright for its invention.

¹⁰ The price was not exactly low as the average skilled worker in Venice might expect to receive that amount over the course of a month.

¹¹ FREDERICK C. LANE, REINHOLD C. MUELLER, *Money and Banking in Medieval and Renaissance Venice*, vol. I: EAD., *Coins and Moneys of Account*, Johns Hopkins University Press, Baltimore 1985, and vol. II: REINHOLD MUELLER, *The Venetian Money Market: Banks, Panics and the Public Debt, 1200–1500*, Johns Hopkins University Press, Baltimore 1997.

the Rose Garlands in 1506. This is where Anton Kolb – de' Barbari's staunchest advocate as noted by Dürer in a letter to Willibald Pirckheimer dated to February of that same year – would have resided.¹²

The nod to German influence might come in an even more subtle way via the eight figurative winds, an allegorical compass rose surrounding the portrait of the city. One wind in particular appears different from the rest. This is the North wind that sweeps down across the Alps (fig. 6). The eyes of his putto-like face are gently covered with a blindfold secured with the most elegant of knots.¹³ This may be due to his directional gaze south where the sun shines brightly, but it may also be because he looks towards the beauty of Piazza San Marco. The face recalls that of blindfolded cupids portrayed by fifteenth-century artists, such as Piero della Francesca (c. 1415–1492) and Andrea Mantegna (c. 1430/31–1506). In this case, perhaps it is the ineffable beauty of the beloved city that renders him blind.

An exchange occurs between the North and South winds – the only two with a star emerging from their lips, from which rays extend and blow across Venice. They are indicated by name (Septentrio and Auster), as well as by the letters T (Tramonta) and O (Ostro). Since their identities are labeled, the repetition of additional signifiers (letters and stars) seems a potential opportunity for de' Barbari to communicate secondary messages. «T-O» (or «O-T») is a cartographic trope for dividing the world – Orbis and Terrarum – ocean and land, Venice and the *terrafirma*. Even more interestingly, Neptune directs his gaze upwards to the Northwest wind, otherwise known as the Corus Circius or M for Maestro (fig. 7). This wind's disembodied face appears in three-quarter view with an eye directed towards Treviso and Seravalle, a nod to the Brenner Pass, the path to Nuremberg. This would have been the very route traveled by de' Barbari before the *View* was published in late 1500, the year in which he was called upon by the Holy Roman Emperor for his ingenuity and invention. Through the agency of artists as well as the movement of material objects, this north-south exchange relates to the theoretical construct and methodological model that Aby Warburg (1866–1929) developed throughout his career. By taking a Warburgian approach to the *View of Venice*, we can conceptualize the iconic image in a new way.

I. The 'Mnemosyne Atlas': an art historical methodology

At the end of his career as an art historian, Warburg created the *Mnemosyne Atlas*, a visual itinerary of his interpretation and thematic understanding of the

¹² For a transcription, see: BÖCKEM, *Jacopo de' Barbari*, p. 29.

¹³ Knots made either out of hair or fabric are a regular feature in works by de' Barbari. Two that date to around the time of the *View* are the *Large Sacrifice to Priapus* and *Judith*.

Renaissance.¹⁴ An innovative methodological model for the discipline at the time of its conception in 1924, Warburg's *Atlas* and its more than seventy image-filled panels succinctly presented concepts that he developed over the course of forty years. These included three separate, yet interrelated ideas: 'Bilderfahrzeuge' (image vehicles), 'Bilderwanderung' (the migration of images) and 'Wanderstraßen der Kultur' (pathways of culture).¹⁵ The first two indicate the potential influence of material objects and their transmission of visual culture through travel to distant places and different societies. Figurative illustrations on Greek vases and their migration throughout the ancient world exemplify such image vehicles. The pathways refer to well-worn trade routes that facilitated the movement of people, their objects and culture, over time. According to Warburg, these phenomena embodied the transfer of ideas and artistic expression from classical antiquity into the Renaissance, or what he called « the after-life of antiquity ».¹⁶ For the purposes of this essay, Warburg's use of these concepts are nuanced in order to underscore the ways in which the medium of print, introduced in the fifteenth century, expedited the transfer of sophisticated artistic and scientific knowledge during the Renaissance.

¹⁴ For recent surveys of the *Mnemosyne Atlas*, see: CHRISTOPHER D. JOHNSON, *Memory, Metaphor and Aby Warburg's Atlas of Images*, Cornell University Press, Ithaca, NY 2012 (A Signale Book) and the companion website, <<https://live-warburglibrarycornelledu.pantheonsite.io/>>, curated by scholars, including Claudia Wedepohl, along with Cornell University Library and the Warburg Institute; ABY WARBURG, *Gesammelte Schriften: Studienausgabe*, vol. II.1: *Der Bilderatlas: Mnemosyne*, ed. MARTIN WARNKE, CLAUDIA BRINK, Akademie Verlag, Berlin 2008; ABY WARBURG, *Mnemosyne. L'Atlante delle immagini*, ed. MARTIN WARNKE, CLAUDIA BRINK, trans. MAURIZIO GHELARDI, Nino Aragno, Torino 2002; ITALO SPINELLI, ROBERTO VENUTI (eds.), *Mnemosyne. L'Atlante della memoria di Aby Warburg*, Artemide, Roma 1999. 'The Keeper' exhibition at the New Museum in 2016 offered a contemporary recreation of the *Mnemosyne Atlas* (<<https://www.newmuseum.org/exhibitions/view/the-keeper>>).

¹⁵ ERNST H. GOMBRICH, *Aby Warburg. An Intellectual Biography*, The Warburg Institute, London 1970 provides an extensive overview of Aby Warburg's intellectual career, including a chapter devoted to the *Atlas*. The notion of image vehicles and migration of images is connected to Dürer on whom Warburg gave a public lecture in October 1905; see: ABY WARBURG, « Dürer and Italian Antiquity (1905) », in Id., *The Renewal of Pagan Antiquity: Contributions to the Cultural History of the Renaissance*, ed. KURT W. FORSTER, trans. DAVID BRITT, Getty Research Institute for the History of Art and the Humanities, Los Angeles 1999 (Texts & Documents), p. 553–558. The idea of *Wanderstraßen* was part of a philosophical dialogue with Warburg's colleague Fritz Saxl; see: DOROTHEA MCEWAN, *Wanderstraßen der Kultur. Die Aby Warburg-Fritz Saxl Korrespondenz 1920 bis 1929*, Dölling-Galitz Verlag, München 2004 (Kleine Schriften des Warburg Institute London und des Warburg Archivs im Warburg Haus Hamburg, 2). On the concept of *Bilderfahrzeuge*, see: ANDREAS BAYER, HORST BREDERKAMP, UWE FELKNER, GERHARD WOLF, *Bilderfahrzeuge: Aby Warburg's Vermächtnis und die Zukunft der Ikologie*, Verlag Klaus Wagenbach, Berlin 2018.

¹⁶ GOMBRICH, *Aby Warburg*, p. 307. For an application of « the after-life of antiquity », see, GEORGES DIDI-HUBERMAN, *The Surviving Image: Phantoms of Time and Time of Phantoms: Aby Warburg's History of Time*, trans. HARVEY L. MENDELSON, The Pennsylvania State University Press, University Park, PA 2017.

In 1929 Warburg presented a lecture with the *Atlas's* panels, each with a variety of arranged images, at the Biblioteca Hertziana in Rome, material that guided subsequent generations of art historians through the re-conceptualization of the field.¹⁷ His visually driven narrative of pictorial forces offered a different model with which to explain the evolution of western art. The title, *Mnemosyne Atlas*, functioned as a précis of its purpose. It alluded to the Greek gods in a way that announced the humanistic, classical basis of Warburg's approach. The god Atlas is traditionally regarded as the progenitor of astronomers and geographers, and the first three panels, coded with the letters A, B, and C (subsequent panels are numbered), include pictorial reference to the cosmological and geographical underpinnings of Warburg's *Atlas*.¹⁸ The title could also allude literally to an atlas as an illustrated itinerary. The memory goddess, Mnemosyne, could relate to collective memory as a formative influence as well as to the transformative nature of images – that is, their ability to shift our consciousness.¹⁹ The *View of Venice* epitomizes such imagery by making an imprint on the viewer's mind. It mesmerizes in such a way that the transfixed image invites renewed engagement in an effort to make the viewer see and understand more of what is being revealed (and concealed) through general impressions as well as specific features.²⁰ It also presents a visually navigable topography.

The late fifteenth-century cultural context in which the *View* materialized demonstrates the applicability of Warburg's use of images, in particular the

¹⁷ Kenneth Clark (1903–1983), Erwin Panofsky (1892–1968), and Ernst Gombrich (1909–2001), three art historical titans directly inspired by Warburg, form part of the genealogy of the field. Clark, who was present for Warburg's lecture, noted that it was one of two moments in Rome that changed his life. See, KENNETH CLARK, « A Lecture that Changed my Life (1974) », in KLAUS BERGER, STEPHAN FÜSSEL (eds.), *Mnemosyne: Beiträge zum 50. Todestag von Aby M. Warburg*, Gratia Verlag, Göttingen 1979 (Gratia: Bamberger Schriften zur Renaissanceforschung, 7), p. 47–48. For an online resource with biographical information about art historians and their professional relationships, including the above-mentioned, see the *Dictionary of Art Historians*, curated by LEE SORENSEN and developed by HANNAH JACOBS at <<http://arthistorians.info/>>

¹⁸ For the shaping of Warburg's thought on the cosmos through discussions with leading thinkers of his time, see: HORST BREDEKAMP, CLAUDIA WEDEPOHL, *Warburg, Cassirer und Einstein in Gespräch: Kepler als Schlüssel der Moderne*, Wagenbach, Berlin 2015 (Kleine Kulturwissenschaftliche Bibliothek, 88).

¹⁹ For a translation/transcription of Warburg's notebooks related to the philosophy of Mneme, see: GOMBRICH, *Aby Warburg*, 270. Bolzoni made a contribution to the notion of memory as a tradition that, while reaching back to antiquity, became a powerful force with the advent of the printed book: LINA BOLZONI, *La stanza della memoria: Modelli letterari e iconografici nell'età della stampa*, Einaudi, Torino 1995 (Saggi, 797).

²⁰ In this, Lefebvre's theoretical idea of Venice as the mutually reinforcing notion of the representation of space and representational space is clearly at play. See HENRI LEFEBVRE, *The Production of Space*, trans. DONALD NICHOLSON-SMITH, Blackwell, Oxford–Malden, MA 1991, in particular p. 73–74.

graphic arts, as image vehicles along pathways of culture. Select panels from the *Mnemosyne Atlas* showcase prints and drawings, such as those featuring ones by Mantegna and Dürer that disclose the transcultural exchange of ideas by visually quoting or paraphrasing each other's subjects and their arrangement. Artists acknowledged each other's creativity, as in the advancement of compositional formats and inventive subject matter, recording skilled intricacy and re-imagining general features in printed and drawn reinterpretations. This can be seen in Dürer's drawing of Mantegna's right-hand sheet of the *Battle of the Sea Gods* (c. 1485–1488), reproductions of which were pinned to Screen 49 of Warburg's penultimate version of the *Atlas* (fig. 8), or Screen 57 of his final one (fig. 9).²¹ The monumental scale of the *View* (the six sheets together measure over 137 x 277 centimeters) and its intellectual scope signal the pioneering exploration of this relatively new reproducible medium. Its makers grasped the power of printed woodcuts in their ability to magnify and broadcast messages conveyed by the image. The *View* – in both its medium and pictorial content – is a quintessential image vehicle.

II. *The exchange of knowledge in printed form*

In Warburg's day, Florence was considered the epicenter of Renaissance culture, while Venice was situated on the margins of study. This is confirmed by the limited number of Venetian works in Warburg's image-filled panels.²² Given today's knowledge of late-fifteenth-century Venice, one might boldly assert that the addition of Venetian evidence would make his model more compelling.²³ In particular, due to the printmaking industry in Venice, the migration of images and their cultural pathways moved not only bi-directionally north and south, but also east and west due largely to the powerful expanse of the Venetian Republic,

²¹ Images by Andrea Mantegna and Dürer from Screens 49, 57 and 58, appeared together on one screen (49) in the penultimate version of the *Atlas* dating to 2 September 1928; this direct juxtaposition more readily revealed the inspired visual dialogue between the images. For the imagery that appeared on the final panels versus the penultimate version, see, SPINELLI, VENUTI (eds.), *Mnemosyne. L'Atlante della memoria*, p. 80, 87–88; and MARCUS ANDREW HURTTIG, *Antiquity Unleashed. Aby Warburg, Dürer and Mantegna*, Courtauld Gallery, London 2013, p. 12, 49.

²² While a comprehensive list of the images remains to be compiled, my review of the final panels dating to 1929 has revealed that there are few Venetian works. Ones identified include: Jacopo Bellini's *Flagellation of Christ* and *Rape of Deianira*; Jacopo Sansovino's *Neptune on the Scala dei Giganti* in the Ducal Palace in Venice; Vittore Carpaccio's *Presentation of the Virgin*; Giovanni Bellini's *Christ the Redeemer*; Jacopo Tintoretto's *Muses*; and Titian or Giorgione's *Fête Champêtre*.

²³ For the past twenty years, there has been a remarkable shift in Renaissance studies. In a roundtable discussion devoted to Venetian art history at the Renaissance Society of America annual conference in NYC 2014, scholars publicly remarked that the number of sessions devoted to Venetian art and culture bore witness to the decentralization of Florence for Renaissance studies; margins have now become centers.

its territories, and its trading networks in the Eastern Mediterranean.²⁴ Of the conglomerate states in 1500 (a unified Italy did not exist until the mid-nineteenth century), only Venice reached beyond the actual peninsula to territories along the Dalmatian coast, and around to Greece and into the Mediterranean basin.²⁵

The Republic's expanse, its position as one of the most powerful states in the Early Modern world, and its port of passage to and from the Holy Land, meant that the city regularly hosted, both short and long-term, people from many different places. It was a nexus of cultural pathways. Opportunity for encounter and dialogue accelerated growth. Such was the case with the Germans who set up some of the earliest workshops for printing and selling books in the final third of the fifteenth century.²⁶ Their time in Venice informed technical practice and allowed it to take root in the industry. In addition to looking at agents of change, it is important to consider processes of cultural exchange. Transfer also occurred with material objects, such as incunabula and prints, woodcut or engraved, which, due to their accelerated rate of reproduction, roamed across Europe, affecting taste and precipitating ideas at a faster pace than previously possible.²⁷

The introduction of printing was an extraordinary phenomenon. Immediately after its germination in Mainz, twelve cities established large print-making industries all of which were notably situated along trading corridors.²⁸ While each of these urban centers made important contributions to book production, Venice quickly became the industry's capital due to its geographical location, long-established trading networks, and authority within the international

²⁴ MONIQUE O'CONNELL, *Men of Empire: Power and Negotiation in Venice's Maritime State*, John's Hopkins University Press, Baltimore 2009, presents recent scholarly consideration of Venice as empire; JOHN JEFFRIES MARTIN's essay, « Between Istanbul and Venice. Agency, Faith, and Empire in the Sixteenth Century », in *Mediterranea*, 3 (2018), p. 219–228, considers the ongoing connection between Venice and the East.

²⁵ WILLIAM SHEPHERD, *Historical Atlas*, Henry Holt and Company, New York 1911, p. 90–91, indicates the expanse of the Republic in 1495. This early atlas, produced by Shepherd during Warburg's career, anticipates the inherent potential of using color to visually convey important information, such as present-day colorization of historical imagery.

²⁶ HENRY SIMONSFELD, *Der Fondaco dei Tedeschi in Venedig und die deutsch-venezianischen Handelbeziehungen*, 2 vols., Scientia, Aachen 1968, reprint of Stuttgart 1887.

²⁷ BERND ROERK, « Venice and Germany: Commercial Contacts and Intellectual Inspirations », in BERNARD AIKEMA, BEVERLY LOUISE BROWN (eds.), *Renaissance Venice and the North*, Rizzoli, New York 1999, p. 45.

²⁸ Contributions to scholarly considerations of printmaking include: RUDOLF HIRSCH, *Printing, Selling and Reading, 1450–1550*, Otto Harrassowitz, Wiesbaden 1967; SEAN ROBERTS, *Printing a Mediterranean World. Florence, Constantinople, and the Renaissance of Geography*, Harvard University Press, Cambridge, MA 2013 (I Tatti Studies in Italian Renaissance History). For an open source, digitized database related to incunabula and fifteenth-century European printing, hosted by the British Museum with international institutional collaboration, see: <<http://www.bl.uk/catalogues/istc/>> In addition to Mainz, the twelve cities include: Leipzig, Cologne, Nuremberg, Augsburg, Strasbourg, Paris, Lyon, Basel, Venice, Milan, Florence, and Rome.

market.²⁹ By 1500, the year in which the *View* was published and its first copies sold, more than two hundred print shops were operating in the city and generating the largest output of books in Europe. Their subjects included philosophy, law, religion, classics, and science. Moreover, the city's resident foreign communities meant that classical texts were translated and printed in a variety of languages, including Greek, Hebrew, and Arabic. Printers not only developed new font types, such as Aldus Manutius's italics, but they also created typefaces for non-Latin alphabets.³⁰

Images also increased the value, complexity, and innovative quality of printed texts. As the distribution of books made their way throughout the known world, textual and visual information was communicated at an unprecedented magnitude and rate.³¹ Within books, printed text was soon aligned with woodcut imagery to communicate complex concepts in both the sciences and the humanities and to illustrate content in novel ways. It was the graphic excellence of books printed in Venice that informed taste.³² Fantastic illustrations elucidated elaborate histories and fictions, such as the poetic allegory, *Hypnerotomachia Poliphili* (published in Venice by Aldo Manuzio, 1499).³³ From a formatting standpoint, the words appear in decorative alignment below the images (fig. 10); imagery and text work together with narrative purpose in an inspired and artistic arrangement that is useful to the fantastical story.

²⁹ For further reading on printmaking in Venice, see: BRONWEN WILSON, *The World in Venice. Print, the City, and Early Modern Identity*, University of Toronto Press, Toronto 2005 (Studies in Book and Print Culture); and MARTIN LOWRY's contributions to this subject: *The World of Aldus Manutius. Business and Scholarship in Renaissance Venice*, Cornell University Press, Ithaca, NY 1979; and Id., *Nicolas Jenson e le origini dell'editoria veneziana nell'Europa del Rinascimento*, Il Velcro, Roma 2002. A 2018-exhibition and catalogue, *Printing Revolution, 1450-1500* (Marsilio), curated by CRISTINA DONDI for the Biblioteca Nazionale Marciana and the Museo Correr in Venice, sought to highlight the importance of the city in the printmaking industry.

³⁰ In particular, see: MARTIN DAVIES, *Aldus Manutius. Printer and Publisher of Renaissance Venice*, J. Paul Getty Museum, Los Angeles, CA 1995.

³¹ It should be noted that it was not until the introduction of the World Wide Web in the late twentieth century, that mass dissemination of knowledge on a global scale occurred once again, a shift that took place over 500 years after the introduction of the printing press.

³² ROERK, « Venice and Germany », p. 46, notes that this excellence attracted many printers, especially German ones, to Venice to learn the trade, and cites Erhart Ratdold of Augsburg, who ran a print shop in Venice as early as 1476 and then 'imported', upon his return home, an acquired technical knowledge of printing as well as its decorative elements, such as initials, Greek letters, and rounded antique characters.

³³ For the most recent consideration and relevant bibliography, see: HELENA K SZÉPE, « *L'Hypnerotomachia Poliphili*, l'avventura tra sogno ed erotismo stampata da Aldo Manuzio », in Beltramini, Guido, Davide Gasparotto (eds.), *Aldo Manuzio il rinascimento di Venezia*, Marsilio, Venezia 2016, p. 137-156. It is perhaps worth noting that Warburg used a woodcut from the *Hypnerotomachia Poliphili* to support an argument in his dissertation that Spring (Primavera) is the woman on the shore ready to receive Venus in Botticelli's painting on the subject. Cf. GOMBRICH, *Aby Warburg*, p. 61.

Representations of cities appear in the *Nuremberg Chronicle* (*Liber Chronicarum* or *Die Schedelsche Weltchronik*, 1493), introducing the notion of place in a systematic ordering of the world.³⁴ Hartmann Schedel, a humanist from Nuremberg who had trained as a physician in Padua, a Venetian annex that served as its university town, composed the text that organized the history of the world into seven ages. A masterpiece of early printing, it was the most extensively illustrated incunabula in its time, a project undertaken by Michael Wolgemut (c. 1434/37–1519) who oversaw the completion of over 1800 high-quality images. Dürer apprenticed with the senior artist, and was also the godson of Anton Koberger, the book's printer.³⁵ Shortly after its publication, Dürer made his first trip to Venice where he met distinguished practicing artists, among them possibly de' Barbari, and sketched novelties he had witnessed in the distinctive city, as can be seen in his comparative drawing of a lady from Venice and Nuremberg (fig. 11).³⁶ Anton Kolb, and quite possibly Dürer, disseminated copies of the *Weltchronik* in Venice.³⁷ Such moving interconnections with their north-south, south-north bi-directionality echo Warburg's *Wanderstraßen der Kultur*.

At this moment of international exchange, printed imagery grew in sophistication. The shift in the medium's scale and novelty facilitated the invention of the unprecedented *View of Venice*. As an epicenter of the print industry and a cosmopolitan magnet at the end of the fifteenth century, Venice sat at the intersection of rich philosophical and ideological exchanges. It was embedded in the study and translations of works by ancient and medieval scholars as well as the generation of new theoretical treatises. Such a climate fostered Jacopo de' Barbari's application of his study of proportion and geometry to his complex artistic representations.³⁸ A double-portrait attributed to the

³⁴ DAVID LANDAU, PETER PARSHALL, *The Renaissance Print*, Yale University Press, New Haven 1994, p. 38–40. The image of Venice in the *Nuremberg Chronicle* was based on that produced by Erhard Reurich for *Sanctae Peregrinatio* (Mainz, 1486). Both these views are linear, profile depictions of Venice, and demonstrate the advanced conception of the *View of Venice* shortly afterwards, in the late fifteenth century. Most of the woodcuts of the cities shown were repetitions based on patterns, the exception being views of Bavarian cities. For more on Reurich, see FREDERIKE TIMM, *Der Palästina-Pilgerbericht des Bernhard von Breidenbach und die Holzschnitte Erhard Reuwichs. Die Peregrinatio in terram sanctam (1486) als Propagandainstrument im Mantel der gelehrten Pilgerschrift*, Dr. Ernst Hauswedell & Co., Stuttgart 2006.

³⁵ GIULIA BARTUM, *Albrecht Dürer and His Legacy*, British Museum Press, London 2002.

³⁶ Dürer's c. 1496–1497 drawing can be found in the Städelsches Kunstinstitut, Frankfurt.

³⁷ For Dürer's possible role, see: RANGSOOK YOON, « Dürer's First Journey to Venice: Revisiting and Reframing the Old Question », in JOHN GARTON, DIANE WOLFTHAL (eds.), *New Studies on Old Masters: Essays in Renaissance Art in Honour of Colin Eisler*, Center for Reformation and Renaissance Studies, Toronto 2011 (Essays and studies, 26), p. 69–87.

³⁸ There is a written exchange between de' Barbari and the Emperor Frederick of Saxony in which the artist discloses the importance of geometry and proportion: « Prima nella geometria poi

artist features the mathematician Luca Pacioli (fig. 12), actively and scientifically working out Euclidian formulae.³⁹ In the painting Euclid's *Elements*, at Pacioli's fingertips, is open to Book XIII, while also on the table a dodacahedron, or Platonic solid, sits atop his *Summa* (published in Venice by Paganino Paganini, 1496).⁴⁰ Pacioli looks up towards a transparent rhombicuboctahedron, an Archimedean solid, and the multiple reflections of an architectural structure inside it. In this, de' Barbari seems to have been recording theoretical connections between geometry and the representation of architecture. The need for graphic exactitude and therefore the value and importance of illustrations in a variety of printed texts, is here visually promoted.⁴¹ The dynamic mapping of ideas – a perspectival restitution dependent on the study of optics and the documentation of Euclidian principles as visualized in the painting – implies de' Barbari's own arcane understanding of complex geometry as well as cosmography, topography, and surveying.⁴² These representational strategies are at play with the *View – man in the cosmic circle* – a Warburgian geographical and cosmological significance.

III. Jacopo de' Barbari's artistic world & graphic invention

Renaissance Venice was ripe for rich and collaborative exchange – artistic, scientific, humanistic. Innovative artists, like de' Barbari, Dürer, the Bellini (Jacopo, Gentile and Giovanni) and Mantegna, fueled awareness and interest in

arithmetica, lequal due necessita nell commensuracione de proportione, chè non poi essere proporcionne senza numero nè poi essere forme senza geometria ». Wiemar, Staatsarchiv, Reg. 0.156, fol. 209–210. In addition, Jacopo de' Barbari supposedly wrote a treatise on the subject, which was preserved in Mechelen while he was under the patronage of Margaret of Austria and resided in her palace.

³⁹ RENZO BALDASSO, « Portrait of Luca Pacioli and Disciple: A New, Mathematic Look », *Art Bulletin*, 92/1–2 (2010), p. 97, fn. 1, addresses the scholarly debate on the attribution of the painting to de' Barbari. Based on scientific and visual analysis, I concur with Baldasso's assertion.

⁴⁰ In the same year that Pacioli published his translation of Euclid's *Elements* in Venice, he also published *Divina Proportione* (1509). The latter included drawings by Leonardo da Vinci, illustrations of the polyhedra in the form of the first published skeletal solids and an open three-dimensional interpretation of the dodacahedron, such as that pictured in de' Barbari's painting of Luca Pacioli. A year prior, on 11 August 1508, over 500 people attended the church of San Bartolomeo to hear Pacioli's lecture on Book V of Euclid. At the end of his 1509 edition of Euclid's *Elements*, he listed the name of ninety-four people who had attended his lecture.

⁴¹ BALDASSO, « Luca Pacioli », p. 89–91. Baldasso argues that Pacioli is in the act of making annotated revisions to previously published, inaccurate illustrations of Euclid's principles. As the author shows, two previous translations of Euclid, published in 1482 by Ratdolt in Venice & 1491 in Vicenza by Leonardo of Basel and Guglielmus of Pavia, had problematic images accompanying text.

⁴² As noted by Baldasso, Book XIII indicates a higher level of geometry; a standard education typically reached only as far as Book V. Cf. BALDASSO, « Luca Pacioli », p. 92.

the graphic arts and their inherent potential for creative expression. Mantegna understood early on that prints, an affordable and reproducible medium, could publicize artistic invention. In addition to new subject matter, the medium liberated compositions from traditional constraints, allowing scenes to extend beyond the confines of a single sheet and imaginatively position figures in space, as in his groundbreaking *Battle of the Sea Gods* (fig. 13a and 13b). Jacopo Bellini (c. 1400–1470/71), father-in-law to Mantegna and head of a successful Venetian workshop paved the way for the consideration of drawings as prized works of art.⁴³ He created two volumes – imaginary views and renderings – one of which Gentile Bellini (c. 1429–1507) offered as a diplomatic gift to the Turkish sultan, the other acquired by the esteemed Venetian collector, Gabriele Vendramin.⁴⁴

Inspired by such pioneers, de' Barbari set out to create his own unique subjects and compositions. His study of a dead partridge, masterful in its realism (fig. 14) and related to the painted *Still Life with Partridge and Gauntlets*, 1504, introduced a new genre. His engraved *Pegasus* (fig. 15), which turns and thus activates the space, is framed in a simple, yet masterful composition. The subject of *Dragons Chasing a Centaur* (fig. 16) represents his fertile imagination.⁴⁵ The caduceus in these graphic works marks the artist's invention; by the time of the *View's* conception, de' Barbari had adopted it as his signature.⁴⁶ A symbol of Mercury, the distinctive staff formed by two intertwined snakes, held a number of meanings in Early Modern Europe. In addition to eloquent communication and commerce, Mercury and his caduceus served as a symbol for artists, foreign dignitaries, and ambassadors in their role as interpreters. While the reason behind de' Barbari's adoption of the caduceus remains speculative, it appropriately aligns with his role as an artistic ambassador as well as the notion of knowledge as a treasured commodity. He continued to use this motif throughout his career, even in his late *Custodi Nos Dormientes* (*The Guardian Angel*),

⁴³ While the inventiveness of drawing was acknowledged as an art form in the fifteenth century, it was not codified until the first edition of Vasari's *Lives* in 1550.

⁴⁴ For more information on Jacopo Bellini's drawings, see in particular BERNHARD DEGENHART, ANNEGRI SCHMITT, *Corpus der italienischen Zeichnungen, 1300–1450*, Gebr. Mann, Berlin 1980. One of a handful of Venetian works on Warburg's panels (see fn. 22) is Jacopo Bellini's *Flagellation of Christ*, presently housed in the Louvre volume.

⁴⁵ There are known impressions of the *Pegasus* at the following institutions: Amsterdam, Rijksmuseum; Berlin, Kupferstichkabinett; Dresden, Kupferstich-Kabinett; London, British Museum; München, Staatliche Graphische Sammlung; Paris, Bibliothèque National; Saint Louis, Saint Louis Art Museum; Vienna, Albertina; There is only one known impression of the *Centaur* in London at the British Museum. See BEATE BÖCKEN, *Jacopo de' Barbari. Künstlerschaft und Hofkultur um 1500*, Böhlau Verlag, Köln 2016, p. 426–427 (Studien zur Kunst, 32).

⁴⁶ I believe the first use of de' Barbari's caduceus is in the *Triumph over the Satyrs*, a large, three-sheet woodcut dating c. 1497. I also believe that this woodcut set a visual precedent for de' Barbari's conception of a large-scale, multi-framed composition with sheets that function both as a composite whole as well as independent images.

where the watermark in the form of a hand, is cleverly positioned to hold Mercury's staff (fig. 17).⁴⁷

Victory Reclining Amid Trophies (fig. 18), yet another print that highlights Mercury, bears analysis in its relationship to de' Barbari's artistic invention and the *View*.⁴⁸ At first glance, the figure appears to recline among a random assortment of spoils amassed from her victories. More specifically, scattered about are articles of warfare, including protective armor (cuirass, helmets and shields) and weapons (spears, swords, arrows, an axe and a battering ram). Their placement and positioning maintain compositional harmony; their artful arrangement suggests the artist's careful study of antique models. Closer examination discloses that select trophies in their particularities, signal Mercury. The winged helmet supported by a stick within the left third of the frame, the helmet with a profile view of Mercury on the ground directly before Victory, and the shield with the frontal face of Mercury supported on his caduceus on the right third of the composition, all highlight and celebrate the god. The caduceus is centered at the top of the page – an anomalous location for the artist's signature and a telling sign in its own way. Given that the piece is dated to shortly after the completion of the *View of Venice*, it is tempting to relate the *Victory* to the artist's recognition of his own notable accomplishments to date, a celebration expressed in laudatory visual language and an easily circulated format. As with the *Guardian Angel*, so here de' Barbari seems to have used his visual sobriquet to applaud himself.

Prior to the publication of the *View of Venice*, de' Barbari had already departed for the court of the Holy Roman Emperor in Nuremberg – the first Italian to receive this prestigious invitation and appointment. Venice, a cosmopolitan port city, and Nuremberg, the site of the Holy Roman Emperor's court, were two of the most vibrant artistic and scientific centers in the Western world at the time. The north-south land route across the Alps connected the two cities, facilitating

⁴⁷ I happened to note the location of this watermark when studying the version of this engraving in the National Gallery of Art, Washington D.C. This is one example of at least twelve impressions of the subject. Rachel McGarry is currently conducting an extensive study of the paper and watermarks within the corpus of Jacopo de' Barbari's engravings, a study first unveiled at a scholarly symposium I hosted at Duke University in October 2017.

⁴⁸ Known impressions exist at the following institutions: Berlin, Kupferstichkabinett; Boston, Museum of Fine Arts; Cambridge, MA, Fogg Art Museum; Dresden, Kupferstich-Kabinett; London, British Museum; Hamburg, Kunsthalle; Minneapolis, Minneapolis Institute of Art; Nuremberg, Germanisches National Museum; NYC, Metropolitan Museum of Art; Oxford, Ashmolean Museum; Paris, Bibliothèque Nationale; Paris, Musée du Louvre; Princeton, NJ, Princeton Art Museum; Vienna, Albertina; ETH, Washington D.C, National Gallery of Art; Weimar, Klassik Stiftung; Zürich. For further consideration, see: JAY LEVENSON, KONRAD OBERHUBER, JACQUELYN SHEEHAN (eds.), *Early Italian Engravings from the National Gallery of Art*, National Gallery of Art, Washington, DC 1973, p. 362–363; LEVENSON, *Jacopo de' Barbari and the Northern Art*, p. 238–241; FERRARI, *Jacopo de' Barbari*, p. 116–117.

commercial trade as well as the physical movement of artists, material objects and hence, ideas. In Nuremberg, de' Barbari and Dürer would have had opportunities to continue learning from one another; both excelled in the arts of painting, woodblock prints, and engraving and both devised theoretical formulae for determining proportions that set off intellectual waves throughout Europe.

Dürer has traditionally been considered the principal translator of Northern and Southern cultures and styles, though de' Barbari was most likely at the fore of the exchange in visual knowledge between the two artists.⁴⁹ While both drew inspiration from each other, their respective engravings of *Apollo and Diana* reveal Dürer's close study of de' Barbari's prints (fig. 19, fig. 20).⁵⁰ Both renditions feature Apollo, god of the sun who drives the diurnal movement of the terrestrial sphere, along with Diana, goddess of the moon who descends with dawn. De' Barbari, however, conceived a more sophisticated composition, one that visually narrates the gods' complementary mythological roles. In it, Apollo stands in contrapposto, poised to release his arrow, as rays of light emanate to indicate his function. Diana, is positioned lower and turned away as the celestial heavens rotate; her head overlaps the deer's antlers which seem to extend from it – a composite of her and her iconographical attribute. Both engravings demonstrate a scientific study of human proportions even if de' Barbari's print shows the figures in a more direct relationship with the world. As has often been noted, while working on his treatise, *Four Books on Human Proportion* of 1523, Dürer confessed that he would prefer to have de' Barbari's understanding of proportion over a kingdom.⁵¹ De' Barbari never disclosed his trade secret, leaving any transfer of knowledge to Dürer and the rest of the world, visual and interpretive. What de' Barbari knew and had in his mind was a precious commodity that he only revealed in poetic, pictorial expression.

⁴⁹ See ULRICH PFISTERER, « Jacopo de' Barbari zu Malerei, Dichtung und Kulturtransfer im Norden », and BEATE BÖCHEM, « Jacopo de' Barbari im Dienst Maximilians I », in MATTHIAS MÜLLER, KARL-HEINZ SPIEB, UDO FRIEDRICH (eds.), *Kulturtransfer am Fürstenhof. Höfische Austauschprozesse und ihre Medien im Zeitalter Kaiser Maximilians I*, Lukas Verlag, Berlin 2013, p. 189–217 and 218–242, respectively.

⁵⁰ ERWIN PANOFSKY, *The Life and Art of Albrecht Dürer*, Princeton University Press, Princeton, NJ 1955⁴, p. 86–87.

⁵¹ Translation: « If I cannot find someone else who has described how to make human proportions, then there is always Jacopo [de' Barbari], a lovely painter, born in Venice. He showed me [figures of] a man and woman which he had made from measurements, and at that time I would have preferred to have had his judgment than a new kingdom, and if I had it, I would have put it into print in his honor for the general good ». German text in WILLIAM MARTIN CONWAY, *The Literary Remains of Albrecht Dürer*, Cambridge University Press, Cambridge 1889, p. 253–254.

IV. Art history and digital methods

Just as Aby Warburg attempted to do with his *Mnemosyne Atlas* in the early twentieth century, so too scholars of art history have embarked on a new methodological approach in the early years of the twenty-first. Driven by scientific advancements in a variety of fields and industries, digital methods grounded in scholarly research questions have demonstrated great potential for the fields of art, architectural and urban history by opening new modes of analysis.⁵² Moreover, the application of digital tools to generate visualizations of art historical research has allowed scholars to conduct deeper inquiries, expand understandings, and make inter-disciplinary discoveries and contributions. And, as in the case of de' Barbari and Kolb's *View of Venice*, technological advancements have enabled the dissemination of knowledge in privileged visual formats. As specifically related to this essay, innovations have presented additional opportunities for public-facing scholarship; assiduously curated interactive displays in museum exhibitions have resulted in new vehicles for transmitting scholarship to an expansive and varied public.⁵³ In short, Warburg's 'Wanderstraßen', or pathways of culture, are now wide open.

A 2017-exhibition that I curated at Duke University's Nasher Museum of Art, *Portrait of Venice: Jacopo de' Barbari's View of 1500*, showcased not only the multifaceted image, but also modes by which digital technologies and visualizations could expand art historical understandings. Some of this exhibition content will form part of a permanent reinstallation of the de' Barbari *View* and the original wooden matrices at the Correr Museum at Piazza San Marco, Venice. Following and building on two previous *Visualizing Venice* exhibitions at the Ducal Palace in Venice that opened in 2015 and 2016 respectively, the 2017-exhibition at Duke was nonetheless the first of its kind as it focused on one standalone work of art, the *View*, which it used as a centerpiece for digital stories.⁵⁴ Capitalizing on

⁵² To name a few of the fields and their technologies that have recently been applied and subsequently led to new discoveries in art, architectural and urban history: Architecture/Historic Building Information Modeling; Meteorology/Lidar & 3D Laser Scanning; Earth Sciences/Ground Penetrating Radar; Cartography/Geographic Information Systems; Computer Science/Machine Learning.

⁵³ At present digital displays in museums serve different functions and purposes. At one extreme, some are intended for playful interaction and games, while at the other end of the spectrum, they communicate substantive art historical research. This article intends to make a distinction between gamification and new modes of research and its delivery.

⁵⁴ *Visualizing Venice* is an inter-institutional research initiative begun in 2010. For further information on it, see: KRISTIN HUFFMAN, ANDREA GIORDANO, CAROLINE BRUZELIUS (ed.), *Visualizing Venice. Mapping and Modeling Time and Change in a City*, Routledge, New York 2018 (Routledge Research in Digital Humanities). The previous *Visualizing Venice* exhibitions include *Acqua e Cibo: Storie della laguna e la città* and *Venice, the Jews, and Europe, 1516-2016*, both curated by DONATELLA CALABI; catalogues with commensurate titles and dates were published by Marsilio Press. For

the possibilities of technology and new media, it recounted multiple different socio-historical and cultural narratives about Early Modern Venice.⁵⁵ It combined art historical, humanities-based research with digital methods, allowing scholarly conundrums and undocumented mysteries to drive select visualizations. In this way, the exhibition and its digital narratives, presented within interactive displays, showcased contemporary advancements in the transfer of knowledge to a public that ranged from experts in the field (prominent in an art museum embedded within a university) to those with little familiarity with Renaissance art. Thus, the *View of Venice*, a *summa* of artistic skill, printed technology, and Venetian preeminence, became once again in the twenty-first century an image vehicle.

The complexity and innovation of the six-sheet print – a unique representation of an urban space at an historically significant moment – necessitated an equally original methodological approach.⁵⁶ The previously acknowledged richness of the *View* has resulted in numerous scholarly studies documenting and identifying a range of subjects from specific sites to people and their activities.⁵⁷ The print has also been the focus of cartographic, representational, and morphological analysis.⁵⁸ Yet, until this exhibition, it could not be fully investigated, analyzed, or visualized due to limitations for up-close study. On the most prominent wall in the two-room exhibition space, viewers could admire the print on loan from the Minneapolis Institute of Art, one of

information on exhibitions that engage with the digital, see: MARK OLSON, « Interactive Exhibitions. New Interfaces for Engaging Visualizations », in HUFFMAN, GIORDANO, BRUZELIUS (ed.), *Visualizing Venice*, p. 92–99.

⁵⁵ I believe the exhibition is progressive in that it shows how one work of art, a portrait of a city, can serve as the centerpiece for the development of an otherwise difficult exhibition with respect to loans, coordination among institutions, and ultimately cost. This concept is replicable with any number of city views at particular moments in history.

⁵⁶ The *View of Venice* offers great visual complexity and sophistication (as Kolb suggested in his appeal to the Collegio); for this reason, it is important to ask 'how' to experience the image and its contents rather than to dwell on the newness of 'what' one sees; in this the *View* does indeed show a remarkable similarity to current ways of cartographic 'looking'. Cf. JURAJ KITTLER, DERYCK W HOLDSWORTH, « Digitizing a Complex Urban Panorama in the Renaissance: The 1500 Bird's Eye View of Venice by Jacopo de' Barbari », *New Media & Society*, 16/5 (2014), p. 770–788.

⁵⁷ Scholars have consistently used the *View* as a document for how the city and specific locations appeared in 1500. For a consideration of activities, see in particular: BALLISTRERI-TRICANATO, ZANVERDIANI, *Jacopo de' Barbari*.

⁵⁸ See: SCHULZ, « Jacopo de' Barbari's *View of Venice* »; HOWARD, « Venice as a Dolphin »; ROMANELLI, BIADENE, *A volo d'uccello*; VANNA BAGARODO, VLADIMIRO VALERIO, « Jacopo de' Barbari. Una nuova ipotesi indiziaria sulla genesi prospettiva della veduta Venetie MD », in VLADIMIRO VALERIO (ed.), *Cartografi veneti*, Editoriale Programma, Padova 2007, p. 119–135; GENEVIEVE CARLTON, *Worldly Consumers*, University of Chicago Press, Chicago 2015, p. 43–45 and 48–49.

twelve extant, first-state impressions.⁵⁹ Nearby, on an adjacent wall, a screen displayed a digital online version of the image that complemented the act of ‘looking’ at the original (<<https://repository.duke.edu/catalog/duke:448098>>). This unprecedented high-resolution, zoomable version magnifies details within the print that are otherwise difficult, if not impossible, to see without a lens (figs. 21a & 21b; VIDEO 2: <<https://duke.box.com/v/Video-2>>).⁶⁰ Museums today present the six separate sheets as a unified whole, making the detail in the upper sections difficult to distinguish, especially when the print is hung on a wall. Glass, a reflective intermediary, poses yet another challenge that the digital image circumvents. Indeed, by studying this exceptionally high-quality, high-resolution image, scholars have already made new contributions to our understanding of Venice, its life, and its art and architectural history, in addition to discoveries about this unique cultural artifact.⁶¹

Like the collaborative production of the woodcut, which brought together at least one surveyor, artist, wood carver, printer, and financier, the exhibition required a variety of expertise for its realization (art and architectural historians, architects, visual and media experts, information technology specialists, archivists/librarians, and museum staff). The exhibition had seven interactive displays – five touchscreens, a sensor-enabled (Arduino connected) 4K screen, an Augmented Reality – situated alongside the woodblock print from Minneapolis.⁶² Embedded within each of the displays was a wealth of art historical content –

⁵⁹ The known first-state prints are located in the following institutions: Berlin, Kupferstichkabinett; Boston, Museum of Fine Arts; Cleveland, Cleveland Museum of Art; Hamburg, Kunsthalle; London, British Museum; Minneapolis, Minneapolis Institute of Art; Nuremberg, Germanisches National Museum; Paris, Bibliothèque Nationale; Venice, Fondazione Querini Stampalia; Venice, Museo Correr, which owns two; Venice, Museo Navale. The print at the MIA was acquired in 2010, and I remain grateful to Rachel McGarry not only for arranging the loan to the Nasher, but also for her support of my project.

⁶⁰ The image is approximately 34,000 x 16,000 pixels. I would like to acknowledge the dialogues that resulted in this digital image, and the individuals who worked with me. They include: Nevio Danelon, Edward Triplett, Ludovica Galeazzo, Hannah Jacobs, Sean Aery, and Will Sexton. I would also like to thank Duke Libraries for hosting the image, the first non-Duke owned object in its Digital Repository. DOI: <<https://dx.doi.org/10.7924/G8MK69TH>>.

⁶¹ There is a forthcoming volume on de’ Barbari’s *View* with scholarly essays that directly benefited from the ability to see the image in greater detail than previously possible. Many of the scholars came to Duke for a symposium I hosted in October 2017, with a final keynote lecture delivered in December.

⁶² For the purposes of this essay, four of the five touchscreens will be considered. It bears noting that the Augmented Reality showed a photographic travelogue (stitched together views, time lapse photography, and photomontages) that included locations exceptionally and rarely accessed in an effort to connect thematically to the notion of Venice past and present. My thanks to Hannah Jacobs for her great contributions to the development of this display.

visual and textual (archival, primary, secondary and theoretical).⁶³ The conceptualization of historical themes and their visualizations expanded on complementary and traditional studies and analyses. In Warburg's *Mnemosyne Atlas*, imagery and its ordered arrangement was intended to reveal visual thematic relationships. The exhibition's multi-media displays achieved the same end, but moved beyond the static limitations of the *Atlas* by expressing the complex intersections of themes in a highly dynamic and visual way. Content was presented in a manner that allowed visitors to discover layers of information that matched their interests. Whereas Warburg had arranged images on panels to present ideas in a sequence, the exhibition permitted visitors to pursue narratives in a non-linear fashion. This happened through the perusal of separate displays as well as through the independent, yet thematically related chapters within each one (as if reading essays in an edited volume). Users were in control of what topics they chose to explore (or not explore), with accessible portals of knowledge at their fingertips. While visually privileged due to the use of parallax, embedded video, or interactive features that vividly and graphically animated complex topics or narratives, chapters within screens also connected text with the visuals in a manner that permitted viewers to dive into content as deeply as they desired. The presented material could be shaped to accommodate the viewer's level of knowledge and curiosity as this new media offers malleable possibilities to the neophyte and cognoscente alike.

The exhibition transported visitors to Venice through an immersive and multi-sensory experience, visually engaging and audibly resonating with ambient sounds of lapping water, creaking ropes, ringing bells, singing birds, and blowing wind, which were layered over a classically inspired music composed for the show. The large-scale (79-inch) 4K screen with harmonious, corresponding sounds, visually explored the city via the *View*, foregrounding its unique features through animation and colorization. Placed in the middle of the room (fig. 22), the screen enticed people to contemplate the image, which was hung in direct alignment with it; the experiential, thematic narratives encouraged viewers to look more closely at the original woodblock print. Like the *View*, this particular display visually emphasized important philological material that supported the selection of animated content.

Chapters on mythology, urban form, and winds illustrated the inimitability of a city built on water and visualized the precision and detail of the woodblock print as it related to mapmaking. Chapters on focal points, churches and green

⁶³ It bears noting that the development of this concept of an interactive touchscreen, with chapters organized thematically according to historical content, and text accompanied with visually engaging features, was the result of close collaboration and development with CamerAnebbia in Milan. This type of display represents an advancement for the communication of historical and art historical material.

spaces revealed how certain patterns emerged around Venice's centers and peripheries.⁶⁴ For example, gardens largely appear as a ring encircling the periphery of the city (VIDEO 3: <<https://duke.box.com/v/Video-3>>). Such discoveries support understandings of patterns in Venice's urban growth, namely the chosen location for monastic and conventual properties and their self-sustainable communities as well as early Renaissance palace-villa life on the Giudecca, a phenomenon that shifted to the mainland later in the sixteenth century. Colorizing the monochromatic image led to insights about garden typology, formal and informal, in addition to previously undetected details, such as roses in bloom with their climbing vines wrapping around trellis walls and arcades (fig. 3).

Two touchscreens, *Piazza San Marco and Rialto* and *Hidden Treasures*, provided access to Venetian urban experience, the function and meaning of certain places, and change over time. One display celebrated Piazza San Marco and Rialto as the two most important sites in the city.⁶⁵ Strategically for Venice, mythical and symbolic, political, socio-economic, as well as architectural and urban interests converged within these principal centers. Digital reconstructions and visualizations represented how they served as meeting places, vital areas of exchange and international negotiation, squares for permanent and occasional markets, and loci for government administration. The adjacent display, *Hidden Treasures*, showed that while at first glance the present-day urban contours of Venice appear to be remarkably similar to those in de' Barbari's *View*, closer examination reveals that change did occur over time.⁶⁶ Napoleon's occupation of the city in 1797 initiated many significant interventions that marked the urban fabric. This digital story explored Venice's hidden riches – lost, demolished, or moved – along with ephemeral urban phenomena. Mapping demolished churches highlighted the significant changes to Venice, such as the zone occupied by the present-day public gardens in the district of Castello, while 3D architectural models offered visitors an opportunity to explore these lost spaces. Digital reconstruction and re-contextualization enabled old, often forgotten stories about place to be told in new and accessible ways. Along with the display on *Hidden Treasures*, the one dedicated to *Piazza San Marco and Rialto* arranged content

⁶⁴ Each of the details has been systematized in a manner that can be used to create a database of information, a next, future step of this project. For example, each of the churches has been isolated, identified, and colorized according to broad categories (i.e. monastic, parish, etc.) that will lead to the addition of data by a team of scholars.

⁶⁵ This display was carefully curated by the architectural historian, Ludovica Galeazzo, who continues to collaborate with me as Assistant Curator for the reinstallation at the Correr Museum in Venice.

⁶⁶ Iara Dundas, an architectural historian and long-time collaborator in the Wired! Lab at Duke University, curated this display.

in thematic chapters, easing movement to sections according to user interest. Museum visitors could read the extensive text, interact with animations or 3D models, watch videos of reconstructions and/or simply observe the layered imagery embedded within each chapter. The screens functioned as metaphorical *Wanderstraßen*, points of access and vehicular pathways that relayed complex themes and scholarly analyses of related imagery and text.

The final, and most apt display discussed here, *The Making of the View*, served as an introduction to the overarching thematic of the exhibition as well as to the woodcut itself – its conception, its historical and cultural value, and the many remaining mysteries surrounding its production. Unanswered questions on how de' Barbari and his team of woodcarvers conceptualized and made the six large blocks were presented alongside known information about cultural context and printmaking as an industry and art form. Animations on the original matrices illustrated simple yet difficult to grasp concepts, such as the wooden blocks as an inverse of the printed sheets and the reverse of its carved image. These were visualized alongside recently acquired data, such as point cloud models of the blocks and new information and understandings gained from their study, neglected in scholarly analysis until now.

The blocks were sculpted in pear wood, a hard wood excellent for carving as well as possessing a certain prestige. In both the woodblock and its prints, one can see that great care has been taken with the details: the entire block was carved with precision and skill, even though the topmost surface lines were the only printed impressions. This means that the negative space has little value, yet somehow, even in the sculpted passages of figures, such as Mercury and the winds, the deeper, carved-out spaces show remarkable care and finesse (fig. 23). This is one reason why the winds are presently serving as case studies for an evolving method that entails studying light laser scans in tandem with the wooden blocks and the print. This work is paving new roads. While conservators have used technologies for examining the state of objects, art historians engaging with such research methods for interpretative value is relatively new.

Like the organization of the exhibition itself, the ongoing investigation of the wooden blocks is collaborative due to its dependence on various expertise. In May 2017, an inter-institutional team of engineers, architects, and art historians conducted photogrammetry and light laser scans for each of the six blocks (fig. 24).⁶⁷ In an effort to interpret the data acquired by the structured light

⁶⁷ I would like to thank in particular, Andrea Giordano, Agostino De Rosa, Emanuela Faresin, Cosimo Monteleone, and Isabella Friso. The photogrammetry, which involves taking photographs around the periphery of an object at multiple heights and then digitally processing them, was reasonably successful, given that a previous attempt in 1999 did not work due to the limitations of software at the time. The quality of the 2017-photogrammetry model, however, remains much lower than the light scanned version due to the dark nature of the

scanning system, a scholarly collaborative (an art historian, a scholar trained in scanning techniques used on cultural heritage objects, and a humanities expert trained in computational data proficiency) has come into being. Because the winds appear in each of the blocks and demonstrate imaginative or artistic tendencies, analysis has begun with them. The point cloud model generated by the light laser scans has been used to indicate depth of carving according to color scale. In tandem with this, the team has conducted measurements of various places within a selected section in order to determine the relationship between the highest surfaces of relief and the deeper carved out passages (fig. 25). What preliminary data and its comparative value in relationship to visual analysis of the extant woodcuts and their blocks has revealed, is that the slopes of the carved lines vary significantly, from gradual to steep. More than serving a structural purpose given the pressure applied during the printing process, this sort of variation points to two different approaches to carving and, therefore, to at least two different hands. Although the study of the wooden blocks is only beginning, a continuation of this approach will yield additional data that may help determine recognizable patterns in the carving techniques and clarify how many different woodblock carvers contributed to the execution of the matrices, hitherto a mystery.

Digital applications in art history have led to an epistemological shift in the field. Developing methodologies, especially when paired with traditional scholarly foundations have opened original lines of research and new modes of inquiry. Visualizations can reveal hidden patterns and address unanswered queries. They can also present material in a manner that potentially awakens an interested public beyond scholars in the field. De' Barbari's adoption of the caduceus as his signature – an allusion to Mercury as messenger, interpreter, interlocutor, and celebrated in the visual language of the *View* – could here be extended to the hermeneutics that digital, visually driven analyses and their modes of expression offer. Visualizations grounded in scholarly research and scientific analysis have the potential to reaffirm art history's place in humanistic discourse and to present complex material in a graphically privileged, yet relatable manner. This emerging art historical methodology breathes new life into Warburg's visual approach and holds the power to extend what he aspired to achieve with his magnum opus. The afterlife of antiquity in the Renaissance may also apply to the afterlife of Renaissance Venice, with the *View* as an image vehicle, past and present.

blocks themselves. The 54–56 light scans of each block generated a dense point cloud model that can be used for study and analysis and offers the possibility of replicating the blocks with the capabilities of 3D printers and laser engravers. A small piece that features Mercury and the lettering VENETIE MD was, in fact, successfully printed for the exhibition.



Figure 1. Jacopo de' Barbari, *View of Venice*, c. 1497–1500. Woodblock print on six sheets, 137,7 x 277,5 cm. The John R. Van Derlip Fund (2010.88), Minneapolis Institute of Art. <<https://repository.duke.edu/catalog/duke:448098>>

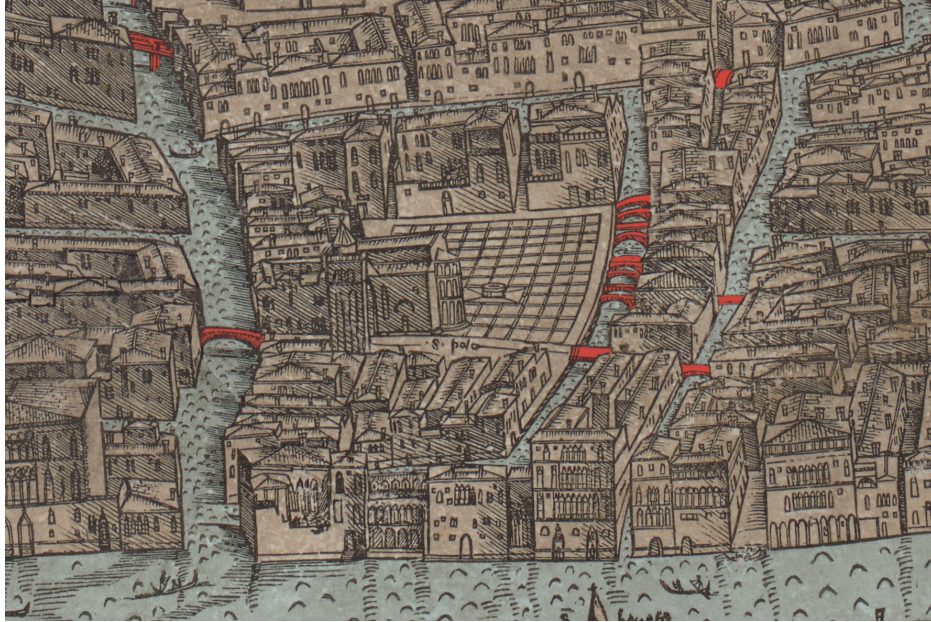


Figure 2. Campo San Polo with colorization. Detail, Jacopo de' Barbari and Anton Kolb, *View of Venice*, c. 1497–1500.



Figure 3. Gardens on the Giudecca with colorization. Detail, Jacopo de' Barbari and Anton Kolb, *View of Venice*, c. 1497–1500.

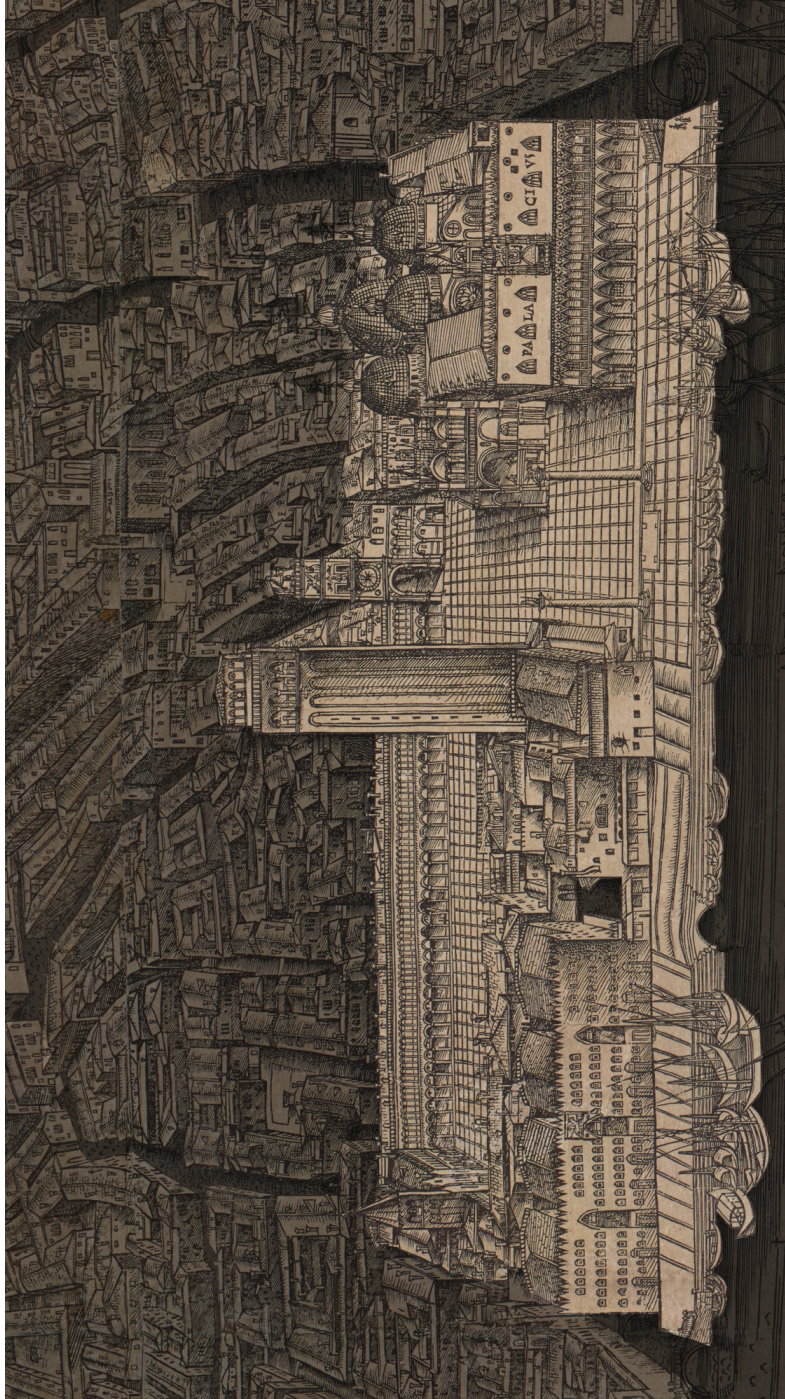


Figure 4. Piazza San Marco highlighted. Detail, Jacopo de' Barbari and Anton Kolb, *View of Venice*, c. 1497–1500.



Figure 5. Alignment of Mercury and Neptune vertically through Rialto, the Fondaco dei Tedeschi specifically, and Piazza San Marco. Detail, Jacopo de' Barbari and Anton Kolb, *View of Venice*, c. 1497–1500.



Figure 6. North wind. Detail, Jacopo de' Barbari and Anton Kolb, *View of Venice*, c. 1497–1500.



Figure 7. Northwest wind. Detail, Jacopo de' Barbari and Anton Kolb, *View of Venice*, c. 1497–1500.



Figure 8. Aby Warburg, *Mnemosyne Atlas*, Screen 49, 2 September 1928.
© The Warburg Institute.



Figure 9. Aby Warburg, *Mnemosyne Atlas*, Screen 57, October 1929.
© The Warburg Institute.

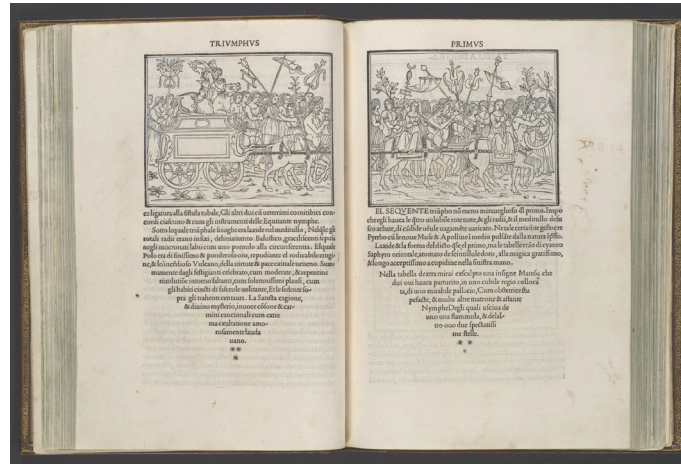


Figure 10. Francesco Colonna, *Hypnotomachia Poliphili*, published by Aldo Manuzio, Venice, 1499. Woodcuts attributed to Benedetto Bordone. 29,5 x 22 x 4cm. The Metropolitan Museum of Art, Gift of J. Pierpont Morgan, 1923. Image in the Public Domain. <<https://www.metmuseum.org/art/collection/search/365313>>



Figure 11. Albrecht Dürer, *Lady in Venetian Dress Contrasted with a Nuremberg 'Hausfrau'*, 1495. Pen, in dark grey-brown on paper, 24,5 x 15,9 cm. Graphische Sammlung, Städel Museum Frankfurt am Main. © Städel Museum – U. Edelmann – ARTOTHEK.



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Figure 13a. Andrea Mantegna, *Battle of the Sea Gods*, c. 1485–1488. Left sheet, engraving, 27 x 40,4 cm. Gift of W. G. Russell Allen, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.



Figure 13b. Andrea Mantegna, *Battle of the Sea Gods*, c. 1485–1488. Right sheet, engraving, 28,8 x 38,1 cm. Gift of W. G. Russell Allen, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.



Figure 14. Jacopo de' Barbari, *Dead Gray Partridge*, 1504. Drawing, 25,7 x 15,2 cm. British Museum, London. © Trustees of the British Museum.

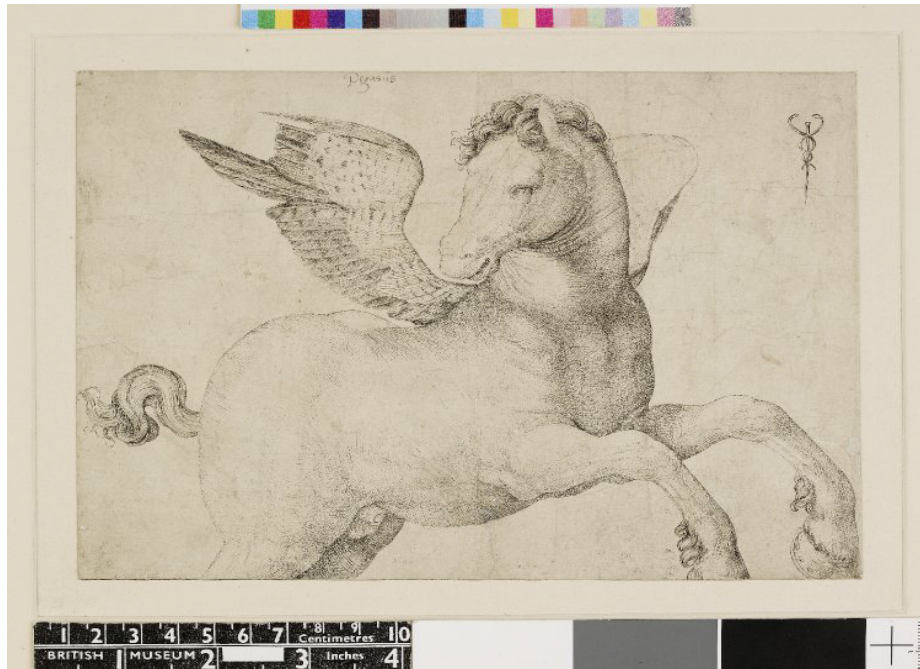


Figure 15. Jacopo de' Barbari, *Pegasus*, c. 1510–1512. Engraving, 15.4 x 21.7 cm. British Museum, London. © Trustees of the British Museum.



Figure 16. Jacopo de' Barbari, *Dragons Chasing a Centaur*, c. 1510. Engraving, 10,9 x 13 cm. British Museum, London. © Trustees of the British Museum.

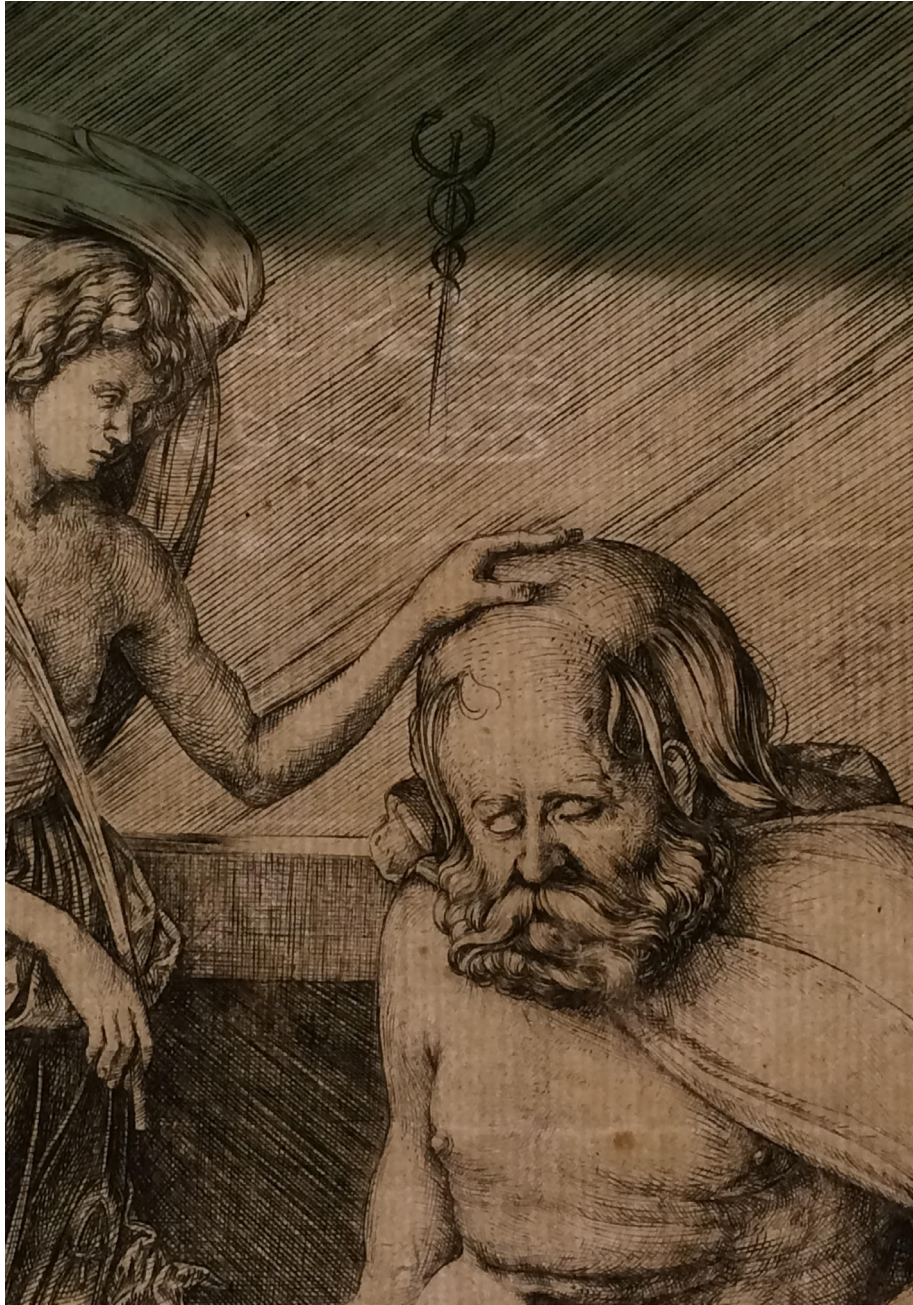


Figure 17. Detail of Jacopo de' Barbari, *Custodi Nos Dormientes (Guardian Angel)*, c. 1510. Engraving, 22,5 x 15,9 cm. Rosenwald Collection, National Gallery of Art, Washington. Photo author.

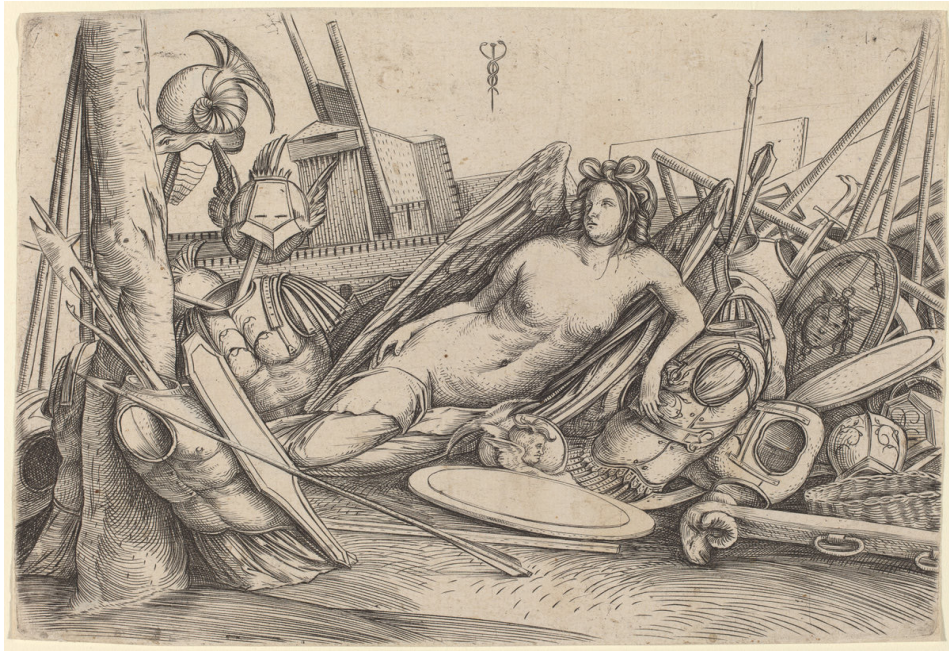


Figure 18. Jacopo de' Barbari, *Victory Reclining amid Trophies*, c. 1500–1503. Engraving, 13,8 x 19,3 cm. Rosenwald Collection, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.

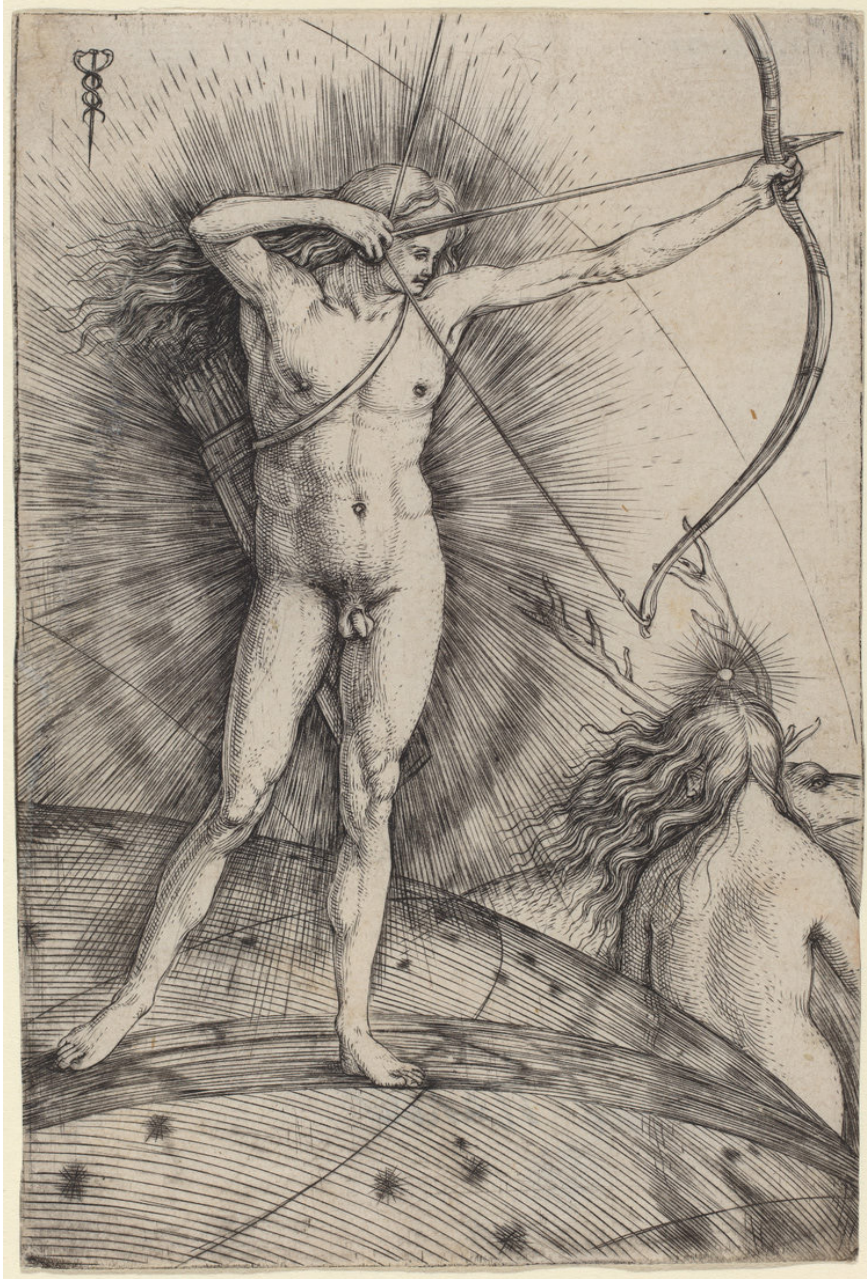


Figure 19. Jacopo de' Barbari, *Apollo and Diana*, c. 1503. Engraving, 16 x 9,8 cm. Gift of W. G. Russell Allen, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.

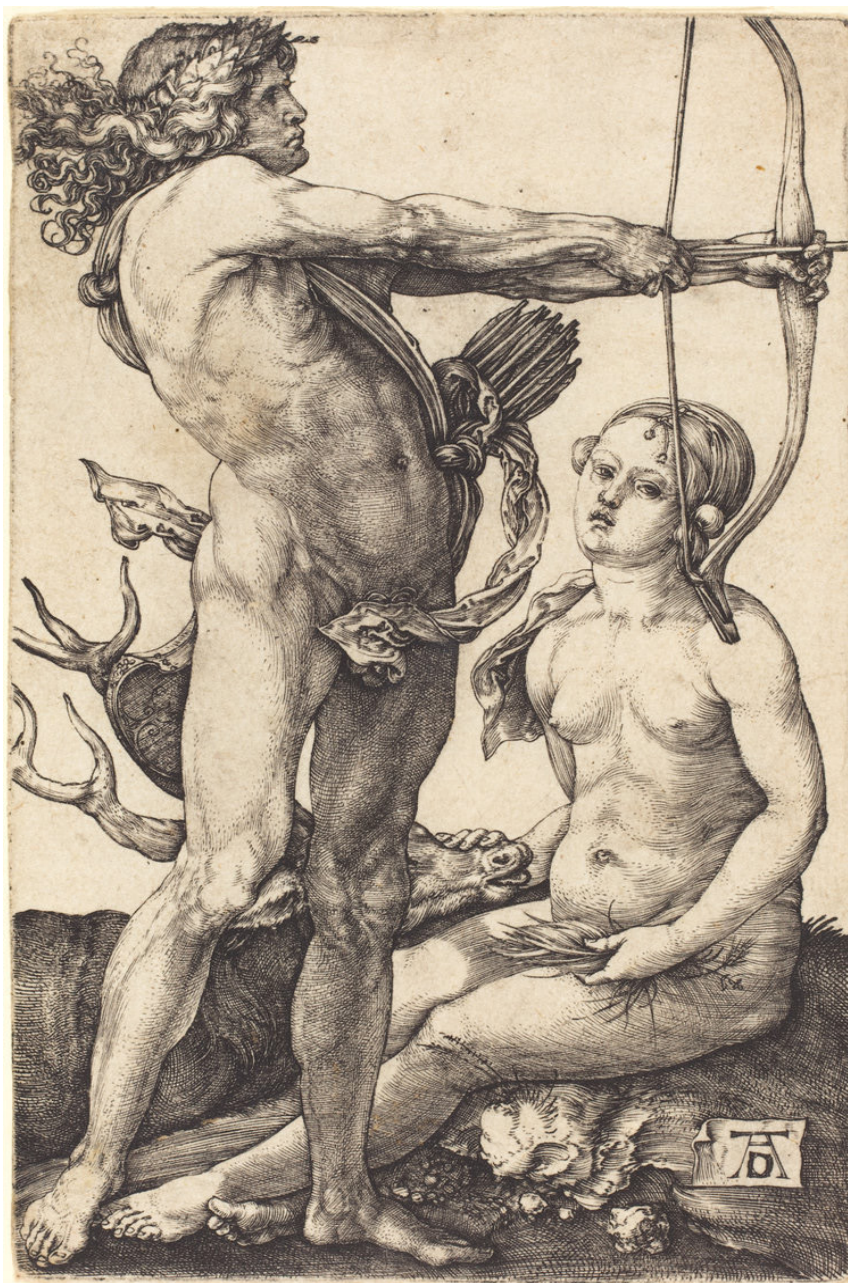


Figure 20. Albrecht Dürer, *Apollo and Diana*, c. 1504–1505. Engraving, 11,6 x 7,2 cm. Rosenwald Collection, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.

Jacopo de' Barbari's *View of Venice* (1500)



Figure 21a & 21b. Touchscreen display visualizing a user zooming in to see details of the *View of Venice* made possible with the high-resolution image housed in Duke's Digital Repository. Photos Alina Taalman. <<https://repository.duke.edu/catalog/duke:448098>>



Figure 22. Museum installation with 4K screen centered in relation to first-state print of de' Barbari's *View*. Photo Hannah Jacobs.

Jacopo de' Barbari's *View of Venice* (1500)

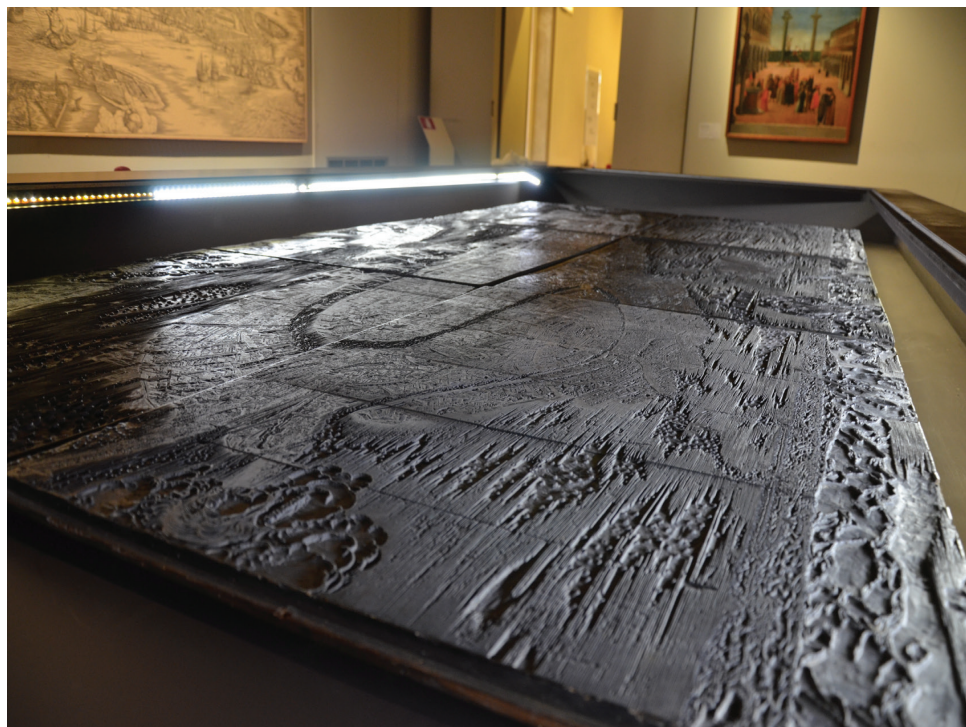


Figure 23. Wooden Matrices and details of Jacopo de' Barbari and Anton Kolb's *View of Venice*, c. 1497–1500. Correr Museum, Venice. Photos Ludovica Galeazzo.

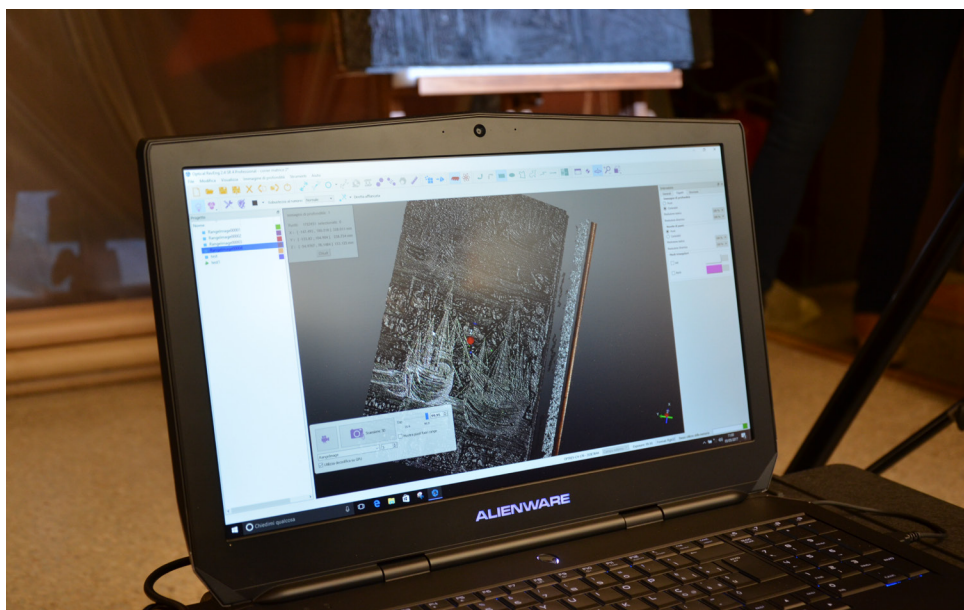
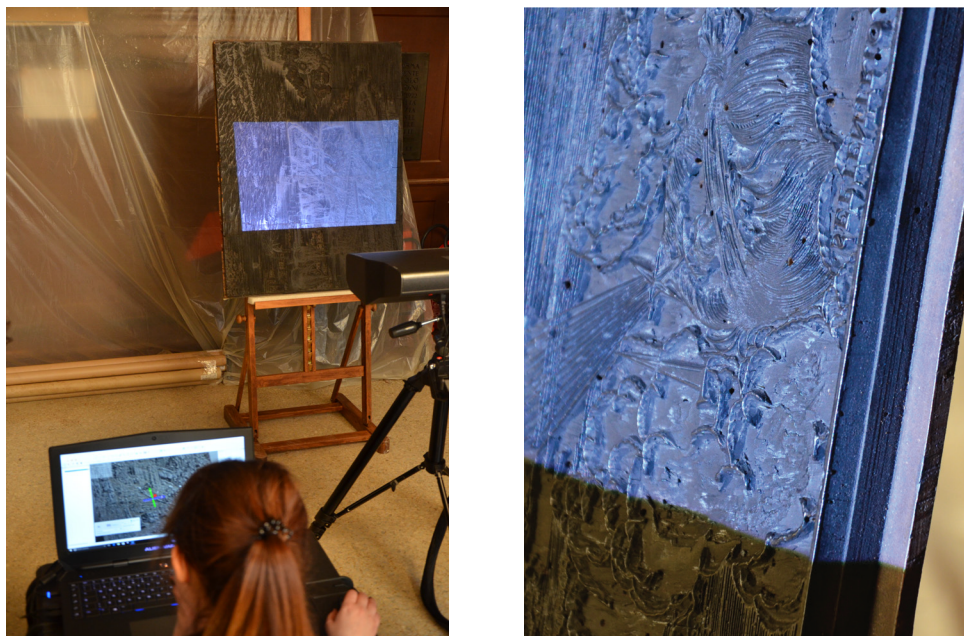


Figure 24. Light laser scans and computer processing of the six wooden blocks at the Correr Museum, May 2017. Photos Ludovica Galeazzo.

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Figure 15. Jacopo de' Barbari, *Pegasus*, c. 1510–1512. Engraving, 15,4 x 21,7 cm. British Museum, London. © Trustees of the British Museum.

Figure 16. Jacopo de' Barbari, *Dragons Chasing a Centaur*, c. 1510. Engraving, 10,9 x 13 cm. British Museum, London. © Trustees of the British Museum.

Figure 17. Detail of Jacopo de' Barbari, *Custodi Nos Dormientes (Guardian Angel)*, c. 1510. Engraving, 22,5 x 15,9 cm. Rosenwald Collection, National Gallery of Art, Washington. Photo author.

Figure 18. Jacopo de' Barbari, *Victory Reclining amid Trophies*, c. 1500–1503. Engraving, 13,8 x 19,3 cm. Rosenwald Collection, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.

Figure 19. Jacopo de' Barbari, *Apollo and Diana*, c. 1503. Engraving, 16 x 9,8 cm. Gift of W. G. Russell Allen, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.

Figure 20. Albrecht Dürer, *Apollo and Diana*, c. 1504–1505. Engraving, 11,6 x 7,2 cm. Rosenwald Collection, National Gallery of Art, Washington. Courtesy National Gallery of Art, Washington.

Figure 21a & 21b. Touchscreen display visualizing a user zooming in to see details of the *View of Venice* made possible with the high-resolution image housed in Duke's Digital Repository. Photo Alina Taalman.

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Figure 22. Museum installation at Duke University's Nasher Museum of Art with 4K screen centered in relation to the first-state print of de' Barbari's *View*. Photo Hannah Jacobs.

Figure 23. Wooden Matrices and details of Jacopo de' Barbari and Anton Kolb's *View of Venice*, c. 1497–1500. Correr Museum, Venice. Photos Ludovica Galeazzo.

Figure 24. Light laser scans and computer processing of the six wooden blocks at the Correr Museum, May 2017. Photos Ludovica Galeazzo.

Figure 25. 3D models of the light laser scans showing carving depths of the Northwest wind. Image by author.