

# PAPER WORLDS

*Printing Knowledge in Early Modern Europe*

*History of Science 215r  
Student Exhibition*



*Collection of Historical Scientific Instruments*  
4 May to 27 August 2010  
Monday - Friday • 11 a.m. to 4 p.m.

# PAPER WORLDS

## *Printing Knowledge in Early Modern Europe*

What are the qualities of the printed image and how do they allow it to construct and communicate knowledge? What new forms of knowledge did prints allow to emerge in the early modern period, when the bright line between science and art had yet to be drawn? More broadly: what did prints make possible?

The images and objects in this exhibition, loaned from Harvard collections and grouped into themes that cut across disciplinary boundaries, offer a range of answers. One section shows how time, a phenomenon that leaves its mark on nature yet is itself invisible, was eloquently visualized in both prints and instruments. Another suggests the imaginary basis of all knowledge when it is structured by visual means – from a ‘city of memory’ in whose edifices a student stores and retrieves abstract concepts, to the map of an imaginary land symbolizing a French literary society, to the exoticizing allegory of a continent.

Prints were never sheer reflections of their subject matter, even in ostensibly more empirical kinds of scientific illustration. A section on scale shows how this factor was necessarily involved – or cleverly manipulated – in representations of natural phenomena lying outside the normal field of vision, such as Galileo’s images of the lunar surface. Another section explores anatomical prints in the wake of Vesalius, arguing that artists lent authority, objectivity, and palatability to their representations of cadavers by playing on the contemporary fascination with classical sculpture.

A range of techniques and uses are in evidence, from woodblocks to engravings and from loose-leaf sheets to book illustrations – not to mention a small but impressive selection of scientific instruments, whose making indeed often required engraving. A section on technique reveals the collaborations and physical operations that lay behind these “paper worlds,” displaying, among other things, an actual sixteenth century woodblock.

What comes across throughout is that prints did not simply disseminate the knowledge projects of early modern Europeans; rather, they were instrumental in creating them.

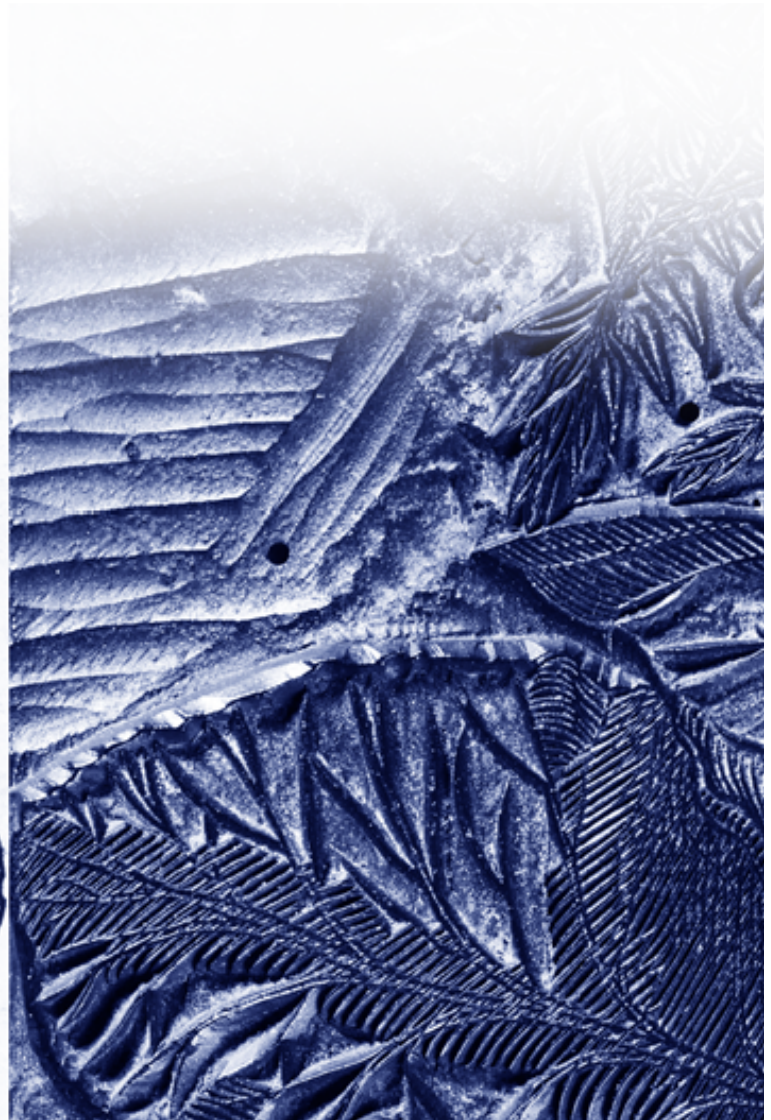
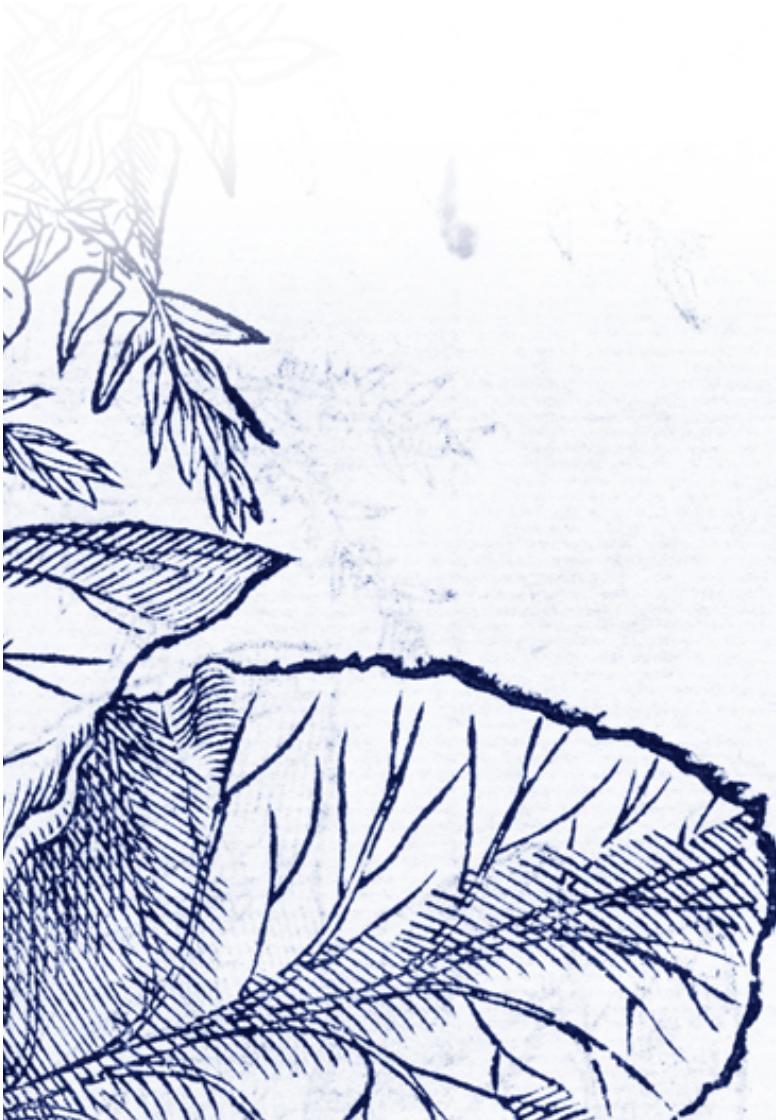


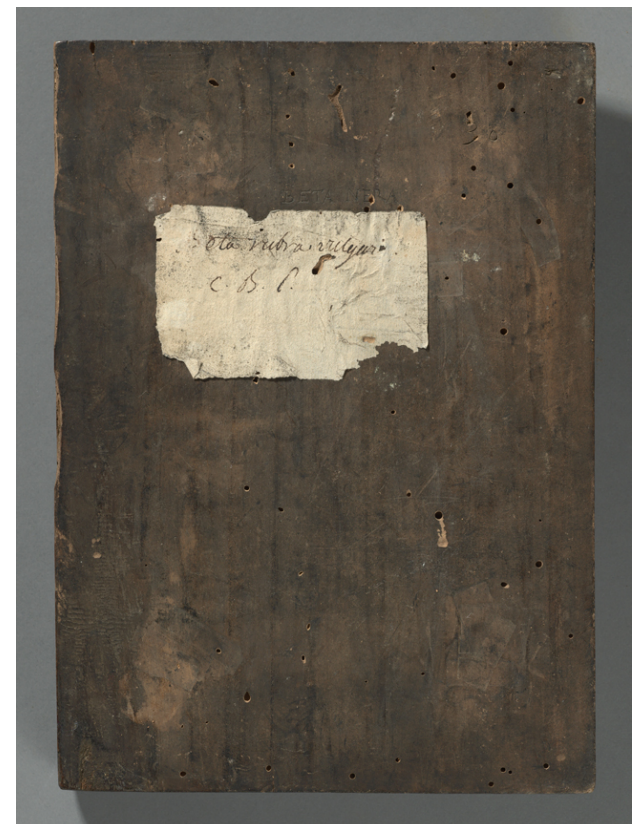
# I Making Prints



# Making Prints

Print technology in early modern Europe developed most rapidly in centers of book production. In their reproducibility, prints could disseminate visual information with an unprecedented degree of consistency across a wide geographic area. In part because of their technical nature, they could make truth claims central to the knowledge projects of the period. Multi-step processes limited the direct expression of an individual artist's "hand", a constraint that allowed scientific prints to present themselves as transparent statements of fact or as transcriptions of material phenomena. Yet as this section shows, prints were the products of a series of physical operations and professional collaborations. Authors seldom produced their own images, either hiring artists or relying on their publishers to do so. The transfer of an image and its cutting into woodblock or copper plate required other artisanal skills, as did the page layout determining the relationship of text and image. Successful images were often pirated or reused by publishers, further complicating their relationship to knowledge production; when considering the status of early scientific images, we should thus expand the idea of authorship to include artisanship and the publisher's commercial intent. The objects on display here privilege the role of the printed image in conveying information, but diverge in their pictorial means. Whereas Mattioli's woodcut emphasizes the powerful presence of a singular beet specimen, the engraving from the later *Description des Arts et Métiers* takes a distanced view, subjecting all information to a compositional structure as mechanical as the objects depicted.





**1. a**  
 Wolfgang Meyerpeck (German, d.1578) after an illustration by Giorgio Liberal (Italian, 1527-c.1579)  
*Bietola Nera* [Black Beet]  
 Woodcut  
 In Pier Andrea Mattioli (Italian, c. 1501-1577), *De i discorsi nelli sei libri di Pedacio Dioscoride anazarbo*, Venice: Felice Valgrisi, 1585  
 Houghton Library, Harvard College Library, Gift of Philip Hofer, 1965 (Typ 525 85.562 F, vol.2)

**1. b**  
 Wolfgang Meyerpeck (German, d.1578) after an illustration by Giorgio Liberal (Italian, 1527-c.1579)  
*Bietola Nera* [Black Beet]  
 Woodblock  
 Pear wood with paper label on verso  
 From the collection of Henri Louis Duhamel du Monceau (French, 1700-1782)  
 Houghton Library, Harvard College Library, Gift of Philip Hofer, 1984 (TypR-87(1))



1.c  
 Makers unknown  
 Woodblock cutting tools [chisel, two gouges, knife],  
 probably 20<sup>th</sup> century  
 Wooden handles with steel blades  
 Harvard Art Museum/Fogg Museum

Tuscan-born doctor Pier Andrea Mattioli won renown among his peers for this herbal, which documents the names, properties and medicinal uses of over one thousand plants, many harvested from a first-century treatise by Greek botanist Dioscorides. Accompanying every specimen discussed in Mattioli's *Discorsi* is a full-page woodcut, each of which required the coordinated efforts of author, artist and block cutter. In their size and density of detail, these illustrations revolutionized conventions for printed herbals. The image shown here depicts a leafy beet, rendered with minute lines revealing the cutter's mastery of the medium. Such verisimilitude enabled the reader, in Mattioli's words, to "inhale the pleasant odor" of the vegetable's flowers and roots.

Though the artists and craftsmen of book illustration in the sixteenth century remain largely anonymous, Mattioli praised the work of his collaborators, enshrining their names in print. It

was in Prague, where Mattioli was personal physician to Archduke Ferdinand, that he first collaborated with Giorgio Liberale, an Italian artist also at the imperial court. Liberale designed over 500 small woodcuts for the first Latin edition of Mattioli's text, which was printed in Venice by Vincenzo Valgrisi (active 1545-1583). Liberale also designed nearly 600 large blocks that appeared in the later Prague edition of his text. The blocks were cut by Wolfgang Meyerpeck, a book printer and block cutter from Meissen who in 1550 received special permission to establish his own press independent of the University in Freiberg. After appearing in Bohemian and German language translations of the text, the blocks returned to Valgrisi's press in Venice. The blocks were reprinted in numerous editions of Mattioli's work, such as this posthumous 1585 Latin edition, published by Vincenzo's heir, Felice Valgrisi (active 1583-1591). In fact, European publishers reissued the *Discorsi* sixty-one times before 1600, making it the most widely circulated corpus of plant life in

that century, and a principal conduit through which Mattioli's contemporaries ingested the botanical knowledge of classical Antiquity.

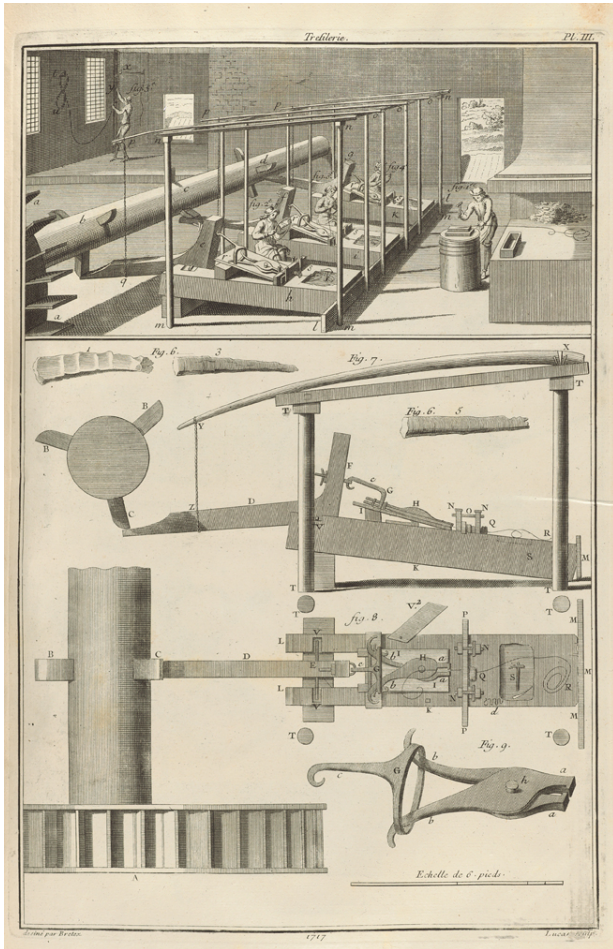
It is not known how he encountered them, but in the eighteenth century, French botanist Henri Louis Duhamel du Monceau bought Mattioli's blocks and printed a selection of them in his *Traité des arbres et arbustes qui se cultivent en France en pleine terre* [Treatise on Trees and Shrubs...]. The 154 blocks used in his two-volume work are now lost, but nearly 700 other blocks remained in his family through the mid-twentieth century. Duhamel pasted paper labels on the reverse of the blocks and recorded the plants' botanical names. This block, one of three in the Printing and Graphic Arts collection at Harvard's Houghton Library, has a label that reads "Beta rubra vulgare C. B. C." In current nomenclature, *Beta vulgaris* refers to the group of cultivated, as opposed to wild, beets and the variety *rubra* is the garden beet. The "C.B.C." inscription refers, in part, to the family *Chenopodiaceae* and the genus *Beta*. These beets were cultivated for their edible leaves which were very dark green, lending this beet its common name, Bietola Nera, or black beet.

Liberale's drawing of the Black Beet was probably designed on the woodblock, as suggested by the elegant, yet efficient use of the rectangular space. The triangular leaves artfully extend into the corners of the block. Meyerpeck very skillfully used block cutting tools such as chisels, gouges, and knives in a range of sizes (represented here by twentieth-century exemplars), to recreate this naturalistic drawing in wood.

The first step in carving a block is the bulk removal of the negative space, the non-printing spaces between the plant forms. The outer edges of the drawn lines were outlined with a sharp knife and then the blank spaces were cut away with chisels and gouges, as evidenced by the narrow, parallel gouge marks at the left edge of the block. Working from gross to fine detail, the smaller spaces around the lines defining the leaves, veins, and shading were carefully cut away with sharp, angled knives of various sizes. A very small knife similar to the one on display might have been used to create the cross hatching seen in the leaves at the center. It was important that while working quickly, the block

cutter not undercut the lines as they were carved. An undercut line might not be strong enough to withstand the heavy pressure of book printing and could crack. The thickness of the woodblock was intentionally about the same height as the metal type used to set the text, allowing words and image to be printed in one pass through the press. During the many printings of this woodblock, its height was adjusted by laying small bits of metal type under the center and corners. The pressure of the printing press caused these metal slugs to leave rectangular impressions on the back of the block, as can be seen near the label and at the lower corners.

Theresa Smith and Daniel Zolli



2.a  
 Claude Lucas  
 French, dates unknown  
 After Louis Bretez  
 French, act. Paris, c. 1700-1740  
*Trefilerie* [Wire drawing]  
 Plate III of V in the series *Art de réduire le fer en fil*  
 [The Craft of Making Iron Wire], 1717  
 Copper-plate engraving on paper  
 In *Description des arts et métiers, faite ou approuvée par  
 Mm. de l'Académie des sciences, avec figures en taille-douce*  
 [Description of the Applied Arts and Crafts, Written  
 or Approved by the Gentlemen of the Academy of  
 Sciences, with Engraved Illustrations], Vol. 9, Paris:  
 Desaint & Saillant, 1761-1789  
 Paris: Desaint & Saillant, 1761-1789 (volume 9)  
 Houghton Library, Harvard College Library, Gift of  
 John Adams, 1789 (A 10.10.15 F)



2.b  
 Catherine and Elisabeth Haussard  
 French, act. 1740-1760  
 After Louis Bretez  
 French, act. Paris, c. 1700-1740  
*L'Art du filtier* [The Craft of Thread Making], 1718  
 Engraved Copper Plate  
 Houghton Library, Purchased on the Amy Lowell  
 Fund, 1937 (TypR-75 (3))



2.c  
 Unknown makers  
*Intaglio tools* [3 burins, scraper, needle, and burnisher],  
 probably 20<sup>th</sup> century  
 Wooden handles with steel blades  
 Houghton Library, Harvard College Library, Bequest of  
 Philip Hofer, 1984 and Harvard Art Museum/Fogg Museum



Along with the more famous Encyclopedia of Diderot and d’Alembert, a coeval but distinct undertaking, the *Description des Arts et Métiers* represents the monumental scale of knowledge projects in the eighteenth century. It both emerges from early modern attempts to describe the natural world and differs from them in kind, separated by fundamental changes in the philosophical understanding of nature and humankind’s relation to it. The *Description* began in 1699 as a directive to the Royal Academy of Science to describe and catalogue the manufacturing processes of France. Although these reports did not begin to be published until 1761, ten years after the Encyclopedia, they were written and circulated within the Academy, and engravings were made as early as the first decades of the eighteenth century.<sup>1</sup> As René Antoine Ferchault de Réaumur, one of the project’s founders, described in a manuscript draft of the introduction, “The history of the arts that we have undertaken to describe is not that of their progress, their decadence; it is that of their practices that are currently in use; we have called this kind of description history of arts, as we name natural history.”<sup>2</sup> As a product of the Academy of Science, which was formed, like the Academy of Art, as an organ of cultural production to be supported by an

absolute monarchy, the *Description* was charged not just with documenting but also with suggesting improvements to the current state of manufacturing. Réaumur’s analogy between natural history and his “history of arts” is supported by the concepts of economy and efficiency as ideals equally applicable to human production and natural processes. This project of surveying the complex landscape of eighteenth century mercantile production served to illuminate operations traditionally associated with guilds, absorbing them virtually through visualization and description into the domain of state control.

The published volumes of the *Description* are divided into long chapters, each of which exhaustively describes the processes, techniques and instruments associated with the manufacture of a particular commodity. Many of these chapters include numerous images inserted at the end of the text, prefaced with elaborate keys explaining the pictures’ contents. The current example, which depicts metal wire production, exemplifies the regularization of format and style throughout the *Description*. Indeed it shares this format with many images in the Encyclopedia, and it is likely that the latter project took inspiration—and even, in some cases, specific images—from these volumes.<sup>3</sup>

Although variations exist, the *Description* depictions of workshop practice are characterized by a division of the page into two registers, a mechanization of space that echoes the proto-industrial processes depicted. Although the upper register appears to function as a narrative scene, the narrative it presents is in itself diagrammatic, rigorously subject to the logic of the grid. It uses the well-worn conventions of pictorial space as the most expedient visual means to express the precise choreography of working body and machine. Although such regimentation of space may appear natural to a modern audience, it was a sharp departure from previous modes of presenting information visually.

This departure was dictated by a change in purpose: rather than depicting unitary material objects, these engravings were charged with presenting temporally and spatially extended processes. They were meant, also, to function as points of cross-reference, as the reader flipped back and forth between images, descriptions, and related chapters, creating a complex web of associations at the heart of the cataloguing endeavor. Indeed projects such as the *Description* and Encyclopedia catered to and created a new kind of reader; not directed at craftsmen who might use the depicted machines, they instead invited perusal, motivated by interest and enthusiasm, by laymen to whom they provided the semblance of complete knowledge. In their recent book *The Culture of Diagram*, John Bender and Michael Marrinan explore this issue of the diagram's reception. Rejecting Michel Foucault's description of the Encyclopedia images as tables laid out for unfettered inspection—therefore instruments of power<sup>4</sup>—the authors emphasize the diagram's "disunified field of presentation—ruptured by shifts in scale, focus, or resolution," which demands the reader's active correlation of information.<sup>5</sup> Describing this new culture of reading, they cite Jean Starobinski's assertion that behind the "imposing façade" of the Encyclopedia "spreads the completely modern activity of discontinuous appropriation that is quick to forget the outmoded constraints of organic unity."<sup>6</sup>

Although eighteenth-century Paris saw the development of many innovative techniques for printing images, especially ones that imitated the fluid lines and tonal variation of painting and drawing, the producers of the *Description*, and, later,

the Encyclopedia, chose to employ traditional line engravings. This technique had changed little since its development in the early modern period<sup>7</sup>. Unlike woodblocks, which are cut in relief, engraving is done by incising a design onto a burnished copper plate and printing from ink left in the grooves, a process that allows for finer, more closely set lines and smoother effects of contour and shadow. Lines are cut into the copper plate using a burin, a tool peculiar to engraving which is held steady in the palm while the other hand moves the copper plate.

This copper plate, shown with the types of instruments that were used to incise it, takes advantage of engraving's potential for grid-like, linear regularity. All traces of artistic presence are erased so that the resulting image might present itself as a fully objective conveyer of information.<sup>8</sup> This plate is part of a remarkable collection housed at Harvard's Houghton library. Encompassing materials produced for a volume of the *Description* whose publication was prevented by the Revolution-- including manuscripts, drawings, working proofs of prints as well as seventeen copper plates-- it highlights that the book's material production brought savants into contact with exactly the sort of craftspeople they were attempting to describe.<sup>9</sup> This plate, for instance, was engraved by the sisters Catherine and Elisabeth Haussard, who were usually employed in the map trade and worked out of a small studio in the Rue du Plâtre in Paris, East of the Rue St. Jacques. The sisters likely worked freelance, deploying their specialized skill of incising clean, precise lines into copper within the complex commercial networks of eighteenth-century Paris.

Alexandra Wachtel

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<sup>1</sup> Charles Coulston Gillispie, *Science and Polity in France: The End of the Old Regime* (New Jersey: Princeton University Press, 1980): the Academy of Science, 81-99; the *Description des Arts et Métiers*, 337-355.

<sup>2</sup> Quoted in Lorraine Daston and Fernando Vidal, eds., *The Moral Authority of Nature* (Chicago: The University of Chicago Press, 2004), 121.

<sup>3</sup> Madeleine Pinault Sørensen, *A propos des planches de l'Encyclopédie* (Geneva: Voltaire Foundation, 1988).

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<sup>4</sup> Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York: Vintage Books, 1973), chapter 7.

<sup>5</sup> John Bender and Michael Marrinan, *The Culture of Diagram* (California: Stanford University Press, 2010), 8.

<sup>6</sup> Jean Starobinski, "Remarques sur l'Encyclopédie," *Revue de Métaphysique et de Morale* 75, no. 3 (1970): 284. Quoted in Bender and Marrinan (2010), 8. Another seminal reading of the Encyclopedia plates is Roland Barthes, "The Plates of the Encyclopedia," in., *A Barthes Reader*, ed. Susan Sontag (New York: Hill & Wang, 1986), 218-35.

<sup>7</sup> For an excellent introduction to printmaking techniques and early workshop practices, see David Landau and Peter Parshall, *The Renaissance Print, 1470-1550* (New Haven and London: Yale University Press, 1994), engraving 23-27.

<sup>8</sup> Although it focuses on a later period, Lorraine Daston and Peter Galison's *Objectivity* (New York: Zone Books, 2007) is a helpful reference for this idea.

<sup>9</sup> For a historical discussion of this collection, see Martine Jaoul and Madeleine Pinault, "La Collection 'Description des Arts et Métiers': Étude des sources inédites de la Houghton Library Université Harvard," *Ethnologie française* 12, no. 4 (1982): 335-359.

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*Staff of the Botany Libraries*  
*Staff of the Francis A. Countway Library of Medicine*  
*Staff of the Harvard Art Museum*  
*Staff of Houghton Library*

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*Samantha van Gerbig, Curatorial Technician*  
*Richard Wright, Curatorial Assistant*

### **Lenders to the exhibition**

*Botany Libraries, Harvard University*  
*Collection of Historical Scientific Instruments, Harvard University*  
*Francis A. Countway Library of Medicine*  
*Owen Gingerich, Harvard University*  
*Harvard Art Museum*  
*Houghton Library, Harvard University*  
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