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IS 583 Book As a Physical Object
Term Paper

Volvelle: The Foundation for Movables

Movable books are a type of book that contains interactive parts. Not defined by a single type of movement, these interactive pieces can involve pieces of paper that flap, slide, wheel, or any other variation. The volvelle is a type of movable consisting of a rotating disc. Originally created in the 13th century,[1] volvelles are foundational in the evolution of other types of movable books, such as the pop-up, peep-show and lift-flap books.

A volvelle consists of one or more, circular or other-shaped pieces of paper or other material stacked on top of each other that rotate though being fastened to a leaf. "Early volvelles were typically constructed of paper or parchment, sewn or occasionally glued to the pages."[2] This allows the pieces of paper to move independently of the other components. By rotating the pieces, the reader can gather various kinds of information. Placing disks on a flat, two-dimensional surface provides a simplified version of a sphere, while stacking multiple disks adds layers of information. The manuscript leaf, meaning a single sheet of parchment or paper within a bound volume, holds the volvelle and serves as the base, while string secures the device to the page. Designers added markings or decorations on this base leaf to help align the information across the several rotating discs.[3]

Scientific scholars typically used the volvelle as a tool for divination, and printers produced them for the upper class.[4] Sixteenth-century volvelles were capable of calculating

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[1] Michelle Gravelle, Anah Mustapha, and Coralee Leroux, *"Volvelles,"* https://drc.usask.ca/projects/archbook/volvelles.php; accessed 11/24/2025

[2] Jessica Helfand, *Reinventing the Wheel* (New York: Princeton Architectural Press, 2002), pp. 18.

[3] Gravelle, Mustapha, and Leroux, *"Volvelles."*

[4] Gravelle, Mustapha, and Leroux, *"Volvelles."*

positions of the sun, moon and the planets with accuracy.[5] Scholars predicted events such as childbirth, crop planning, and critical days in illness cycles based on planetary alignments.[6]

In some cases, printers and publishers intended others, like the reader, to construct the volvelle.[7] As Sid Berger explains, "parts of the volvelles were printed on large flat sheets, and the reader was expected to cut the volvelles out and attach them to the printed pages in the proper place. Usually, however, the book was issued with the volvelles already properly attached by the publisher."[8] When readers did participate in assembling the volvelle, their role shifted from passive consumption to active engagement.[9] This process gave them a measure of editorial control, since the accuracy of the device depended on their choices in cutting, aligning, and fastening the discs. In effect, the reader's hand shaped how the information could be accessed and interpreted. However, if the reader assembled incorrectly, the information in the volvelle could be useless. The stereotypical author, publisher, reader relationship was not necessarily applicable to early volvelles. Reader-assembled volvelles served as both interactive devices and effective educational tools.[10] Instead of receiving static information, the reader took an active part in constructing the device; in doing so, the reader came to understand the content to assemble the device correctly. Once readers constructed a volvelle, they had to manipulate it manually to reveal information. This continuously required the reader to be involved in the discovery and form of the information.

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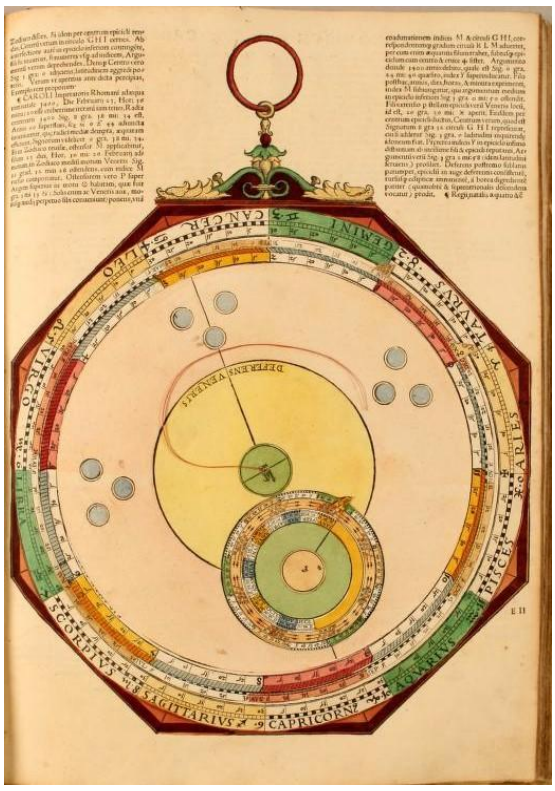
[5] Helfand, *Reinventing the Wheel*, 22.
[6] Helfand, *Reinventing the Wheel*, 22.
[7] Gravelle, Mustapha, and Leroux, "*Volvelles*."
[8] Sid Berger, editorial comments on draft paper, November 27, 2025.
[9] Gravelle, Mustapha, and Leroux, "*Volvelles*."
[10] Suzanne Karr, "Constructions Both Sacred and Profane: Serpents, Angels, and Pointing Fingers in Renaissance Books with Moving Parts," *The Yale University Library Gazette* 78.3/4 (2004): 107.

Volvelles grew in popularity in the 16th century and culminated in the work of Peter Apian's *Astronomicum Caesarium*.[11] Considered a foundational work in the volvelle type, *Astronomicum Caesarium* features fifty eight full-page hand-colored astronomical and astrological woodcuts.[12]

The woodcut is one of the oldest forms of printmaking and is a relief process which involves carving designs into a wooden block. Carvers leave certain areas raised, then ink and press them onto paper. The result is an image that appears in reverse of the carved design.[13]



Apian's book features twenty-one of the woodcuts that include volvelles' computing planetary positions, eclipses, and the times of crisis in illness.[14] Many volvelles include a smaller, secondary wheel or pointer attached at the circle's central axis, allowing multiple discs to rotate together while still presenting distinct layers of information.[15] [16]

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[11] Peter Apian, *Astronomicum Caesareum* (Ingolstadt: Apianus Press, 1540), Internet Archive, https://archive.org/details/astronomicumcsar00apia; accessed 12/1/2025,

[12] Rolf Gislén, *Hidden Volvelles: A Study of Concealed Movable Diagrams in Early Printed Books* (paper presented at the conference "Architectures of the Book," Lund University, 2003), pp. 802.

[13] Author Unknown, "Woodcut." https://www.metmuseum.org/perspectives/materials-and-techniques-printmaking-woodcut; accessed 11/24/2025.

[14] Gislén, *Hidden Volvelles,* 802.

[15] Helfand, *Reinventing the Wheel*, 20.

[16] Petrus Apianus, *Astronomicum Caesareum* (Ingolstadt: Apianus Press, 1540), image 38 of 130, Internet Archive, https://archive.org/details/astronomicumcsar00apia/page/n37/mode/2up; accessed 12/1/2025.

Apian's purpose in writing *Astronomicum Caesareum* was to make astronomy more accessible not only to scholars but also to educated lay readers, and particularly to his patrons and the namesake of the book, Emperor Charles V of Rome and his brother King Ferdinand of Spain. In place of complex mathematical calculations, Apian employed graphic methods to solve astronomical, astrological, and ecclesiastical problems, offering a more visual form of learning than text alone.[17]

Apian designed the volvelles after the astrolabe, a metal device that measured celestial positions, and he transferred those concepts to paper in the form of a bound book.[18] In *Astronomicum Caesarium*, the volvelles contain as many as five rotatable dials, which give central, eccentric, and epicyclic movements to harmonize with the Earth-central theory of stellar movements, and up to three silk threads to act as reference lines.

Apian created volvelles based on differing astronomical predictions he was calculating. For example, Apian's volvelle to predicting eclipses included an illustrated base with a dragon motif which indicated when eclipses could and could not occur.[19] [20] The second dial improved the accuracy of the first by representing a spiral calendar of eleven rings. When the two align, predictions become more precise.[21]

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[17] Peter Apian and S. A. Ionides, "Caesars' Astronomy: (Astronomicum Caesareum)," *Osiris* 1 (1936): 357, http://www.jstor.org/stable/301615.

[18] Rheagan Martin, "Decoding the Medieval Volvelle," https://blogs.getty.edu/iris/decoding-the-medieval-volvelle/; accessed 11/24/2025.

[19] Apianus, *Astronomicum Caesareum,* image 48.

[20] Apianus, *Astronomicum Caesareum,* image 48.

[21] Apian and Ionides, *Caesars' Astronomy*, 379.

Unlike other volvelles at the time, Apian's work is unique because he assembled them. Apian's decision to assemble, before the volume was issued to the public, allowed for the creation of intricate illustrations. The base of the volvelle had various illustrations, including those reminiscent of the astrolabe and dragon motifs.[22] Apian spent eight years creating the *Astronomicum Caesarium* [23] The work not only enables scientific calculations but also demonstrates Apian's artistic ability.

The materials used in the creation of the *Astronomicum Caesarium* are a testament to an upper-class demographic. At the time of production, Peter Apian was located in Ingolstadt, Germany which provided him access to luxury material's being traded throughout Europe.[24] Originating from China, the silk industry spread to Europe with Cologne, Germany, playing a leading role in production.[25] Apian's proximity to silk and his upper-class clientele resulted in silk thread's being used in his books. The thread was a durable material and could be used to secure the rotating elements of the volvelle. The usage of silk was practical and symbolic, as it allowed the volvelles to function while relaying a message of wealth and sophistication.

The paper used for the *Astronomicum Caesarium* was also of high quality. In 1540, papermakers produced what was known as rag paper, made from linen and cotton rags. The process of papermaking involved collecting and fermenting the rags, pulping them, forming sheets in molds, and then pressing and drying the paper.[26] Watermarking was sometimes included

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[22] José Chabás and Bernard R. Goldstein, "A Commentary on the Volvelles in Petrus Apianus' *Astronomicum Cæsareum*," *Journal of Astronomical History and Heritage* 21.2 (2018): 136.

[23] Author Unknown, "Astronomicum Caesareum (Ingolstadt, 1540)," https://www.lib.uchicago.edu/collex/exhibits/they-saw-stars-art-and-astronomy/early-representations/astronomicum-caesareum/; accessed 11/25/2025.

[24] William B. Ashworth, Jr., "Scientist of the Day – Peter Apian, German Mathematician," https://www.lindahall.org/about/news/scientist-of-the-day/peter-apian/; accessed 11/25/2025.

[25] Author Unknown,"Frontispiece of Johann Stephan Pütter, Historical Development of the Constitution of the German Empire (1788)," https://germanhistorydocs.org/en/the-holy-roman-empire-1648-1815/ghdi:image-2713; accessed 11/24/2025.

[26] Timothy Barrett, "European Papermaking Techniques 1300–1800," http://paper.lib.uiowa.edu/european.php; accessed 1/1/2025.

as part of the sheet-forming stage. Afterward, the paper was finished through smoothing and sizing to prepare it for writing or printing. This process demanded intensive labor and required skill to process the paper correctly. Because of this, rag paper was costly, yet it produced a durable and high-quality material for works such as the *Astronomicum Caesareum*.[27]

Eventually, readers used the volvelle more widely, physically and in content, beyond scholarly publications. The evolution of the movable book would include the creation of pop-up, peep-show, and lift-flap books. The demographic of movables would also change as the books became accessible. No longer would these books be limited to the upper-class; they would eventually spread to all classes and ultimately be used predominately in children's books.

Although preceded by earlier works such as Ramon Llull's *Ars Magna,*[28] the combination of quality of materials, beautiful illustrations, and Apian's calculations have made *Astronomicum Caesarium* a foundational work in movable books and printmaking. This work exemplifies the transformation of static texts into interactive instruments from which the reader can learn. Apian fastened and anchored the layered discs with silk thread, illustrated them with woodcuts, and printed them on rag paper, creating a testament to luxury and sustainability. Overall, historians of science and book history emphasize the volvelle's importance to the creation and evolution of the movable book. Its usage advanced scientific methods and book making, while also shaping how the readers organized and interpreted information.

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[27] Barrett, *European Papermaking Techniques.*

[28] Ramon Llull. *Ars Magna Generalis et Ultima.* (Lyon: Claude Nourry, 1517), https://archive.org/details/bub_gb_rG_yINh8V1gC; accessed 12/1/2025