

Playful Science: Games, Didactic Resources, and Interactive Books

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ABSTRACT

This paper presents an expanded version of the talk delivered on December 12, 2024, at the seminar “Emersioni di carta. Giochi e pagine di scienza per ragazzi tra Otto e Novecento”. It is enriched with additional data and insights. Beginning with Comenius’s *Orbis Pictus* (1658), the contribution showcases a selection of scientific books featuring volvelles, along with loose sheets, rotating planispheres, and astronomical games. These items are part of a careful overview of little-known interactive materials, most of which belong to the collections hosted by the Fondazione Tancredi di Barolo in Turin.

KEYWORDS

Orbis Pictus; Volvelle; Astronomia.

CITATION

Vagliani, Pompeo, “Playful Science: Games, Didactic Resources, and Interactive Books”, *JIB*, 4 (April 2025): 52-61. DOI: 10.57579/2025.

On December 12, 2024, an event was held at MUSLI – Museum of School and Children’s Books titled “Emersioni di Carta. Giochi e pagine di scienza per ragazzi tra Otto e Novecento” (“Paper Emergences. Games and Pages of Science for Children between the 19th and 20th Century”). The conference, organized by the Department of Historical Studies of the University of Turin, the Tancredi di Barolo Foundation, and the International Centre on Interactive Books, was coordinated by Lodovica Braidà (UniTo) as part of the seminar series for the Master’s Degree in Book, Document and Cultural Heritage Sciences. It inaugurated the traveling program Paper Surfacing, curated by Elisa Marazzi (UniMi) and Ilaria Ampollini (UniMi).¹ This article offers a transcript of the presentation, supplemented with additional research insights.

While preparing for the seminar, I found myself reflecting on the possible “paper emergences” in games and books between the nineteenth and twentieth centuries, and I immediately felt the need to structure my talk around a specific selection of interactive books – first and foremost because they represent a truly submerged heritage, full of research insights that often elude cataloging, and which, once “surfaced”, invite new paths of interdisciplinary inquiry – a great resource and opportunity. Another concept that has always accompanied this reflection for me is osmosis... movable devices are osmotic materials, meaning there are constant transitions from the animated plate, to the book, to the game – and so the walls separating various disciplines become, in turn, permeable. The beautiful thing is that it doesn’t matter where you begin to study them – any starting point is equally valid. One proceeds jointly, working by axioms; sometimes the connections are hard to find, or the information and indexes are missing – so this becomes, too, a challenge to the kind of mental approach the case demands. When speaking of science for children, it seemed only natural to start with the fundamental mechanism of the animated book since antiquity: the volvelle, a rotating disc that establishes relationships and represents movement. And with Comenius, whose *Orbis Pictus* stands as an emblem of the illustrated educational book capable of introducing children to the study of science and the sensible world. In his moment of innovation, Comenius feels the need to include the volvelle device – on the one hand an heir to ancient animated books, and on the other the earliest recorded use of a movable device in a children’s book. It is a design approach to the page that fosters a continuous dialogue between verbal, logical, and cognitive discourse and imagery. In the first 1658 edition preserved at the French National Library (Fig. 1 a, b)² page 10 is blank, because the volvelle had not been cut out and properly inserted, even though there is also an instruction to the bookbinder on how the volvelle should be assembled, with a fairly detailed description:

This figure belongs to the tenth sheet and must have a piece inserted into the larger one, cut out at the center and placed underneath it so that it can rotate around it.

* The translation of this contribution, originally written in Italian, was carried out by the editorial team of JIB and was produced in order to provide wider dissemination of the content to an international audience. Unless otherwise specified, the images come from the archives of the Tancredi di Barolo Foundation, Turin. Special thanks to Dr. Giorgia Riscaldino, who supported the historical and iconographic research, and to Prof. Maria Gabriella Bruno, who transcribed the presentation text. Websites were verified as of April 10, 2025. All URLs exceeding thirty characters have been shortened using the [TinyURL](https://tinyurl.com) service.

1 Elisa Marazzi presented a paper titled *Publishing Movable Books*, while Ilaria Ampollini spoke about *Pop-ups, Board Games and Cards: When Science Becomes Touchable*. The full recording of the event is available on our research center’s website: <https://tinyurl.com/3remnwey>.

2 <https://tinyurl.com/46umnvwj>.

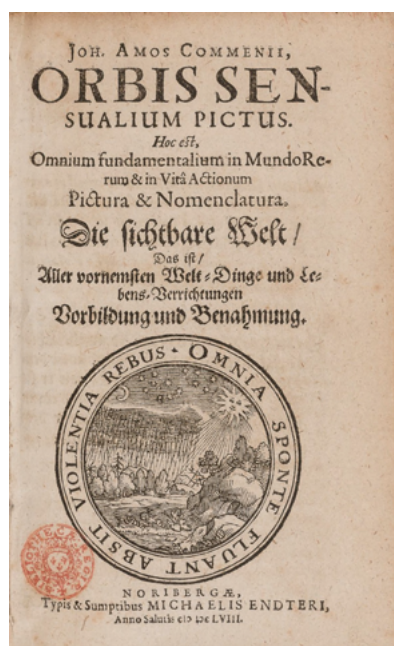


Fig. 1 | J. A. Comenius, *Orbis Sensualium Pictus...Die Sichtbare Welt*, Nuremberg, Endter, 1658. (French National Library, Rare Books Department, RES-X-1857). Title page and cut-out vol-
a, b | velle with binding note.

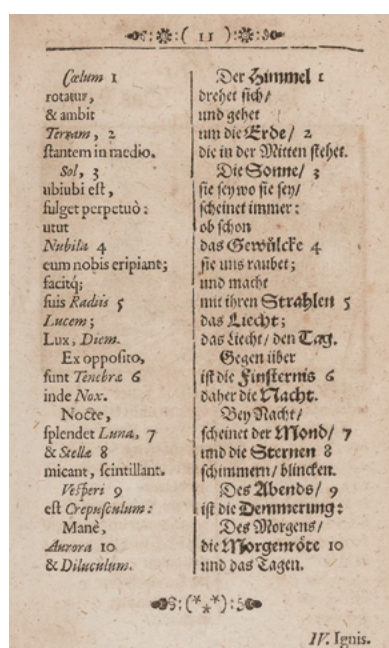
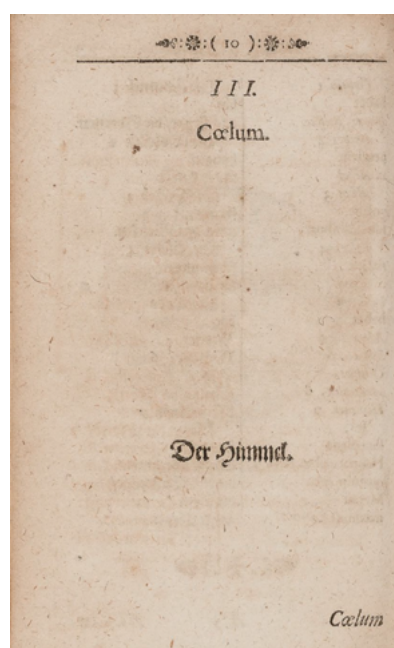


Fig. 1 | Page 10 dedicated to the
c, d | sky where the volvelle was meant to be mounted, and page 11 listing the elements represented in the device.

The two wheels therefore had to be cut out, assembled, and properly affixed to the page of the *Orbis* dedicated to the Sky (the tenth sheet of the book) (Fig. 1 c), where a specific space had been left empty for the placement of the volvelle. In this way, the moving image could effectively interact with the textual description printed on the facing page, p. 11 (Fig. 1 d), thus facilitating both the immediate identification of the names represented on Earth and in the sky, and the understanding of the description of the sun's and planets' rotational movement around the Earth, according to the Ptolemaic model. Through the act of manipulation, the complex concept described by the verb *rotatur* is enacted, and thus a complete correspondence between action and verb is made possible.

This volvelle is a true “surfacing”, as it has received little attention from scholars despite being central to the history of the book. The reason for this gap is material in nature: the rotating devi-

ce is almost always missing from surviving copies of the *Orbis Pictus* – either because it was never assembled or because it was damaged. In our collection, we preserve a late eighteenth-century quadrilingual edition (1769) (Fig. 2 a, b, c) in which the volvelle is present, its iconographic layout redrawn to include the Earth with its waters, the terrestrial sky, the sun, the moon, and the planets. What stands out most is the presence of color – absent from all published editions of the *Orbis Pictus*. In this case, the color was added by an expert hand (certainly an adult), representing an enhancing intervention. From a mechanical point of view, the person who assembled the volvelle also added an extra feature: a small lever that allowed the flap of paper to be lifted, held between the fingers, and rotated.



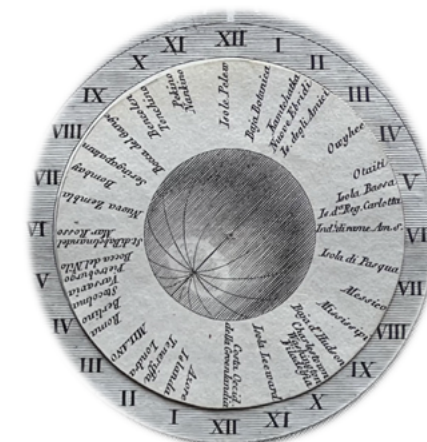
Fig. 2
 a, b, c
 J. A. Comenio, *Orbis Sensualium Picti/Der Sichtbaren Welt*, Norimberga, Endter, 1769.
 Title page, p. 11 and hand-colored volvelle.

Another example of emergence, once again involving a book with a volvelle, is found in Goldsmith's geography textbook, *Geografia compendiosa per uso della gioventù*, published in Italy by Vallardi in Milan in 1819 (Fig. 3 a, b). In this case, the volvelle is used to represent time zones – a mechanism that appeared for the first time in Italy in this edition, derived from the 47th English edition. Starting from an interest in the Italian edition preserved in the FTB archive, a fascinating publishing history emerged, allowing me to identify the author's identity³ and the editorial events⁴ connected to it.

The “geographical clock” is placed as a frontispiece to the book: on the fixed page, “day” is illustrated at the top and “night” at the bottom; consequently, the upper part is illuminated, while the lower part is in darkness. On the left, morning is represented; on the right, evening.

3 “Reverend J. Goldsmith” is the pseudonym of Jeremiah Joyce (1763-1816), a prolific popularizer of science and author of numerous editorial products accessible to an audience of children and adults. In London in the early decades of the 19th century, Joyce, earning his living thanks to the speculation of publishers in a developing market, published with Phillips anonymously or under pseudonyms, an agreement that met the interests of the publisher who was thus relieved of the duty to pay him royalties.

4 The first edition of the volume *A Grammar of General Geography for the Use of Schools and Young Persons* dates back to 1803 and was published by Phillips, who issued the volume again in 1806 (University of Pittsburgh: <https://tinyurl.com/yfx4fbsw>) and in 1811 (Complutense University of Madrid: <https://tinyurl.com/3wjyix34>). Starting in 1812, Longman acquired the rights and republished it in 1829 (British Library: <https://tinyurl.com/c42s62xy>).



Another variant of a geographical volvella is found in the book *A Comprehensive Grammar of Sacred Geography and History*, a geography of sacred places fundamentally linked to the New Testament (Fig. 5 a, b). The volvella enriches a section – previously absent – on the places of Asia



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Minor, which are the ones directly involved in this book.

Staying on the topic of what we might call geographical volvellas, there is an Italian example whose provenance I have not been able to trace precisely. It is a rotating disc included as a loose insert in the *Enciclopedia dei ragazzi*. It is undated but, judging by the graphic style, it

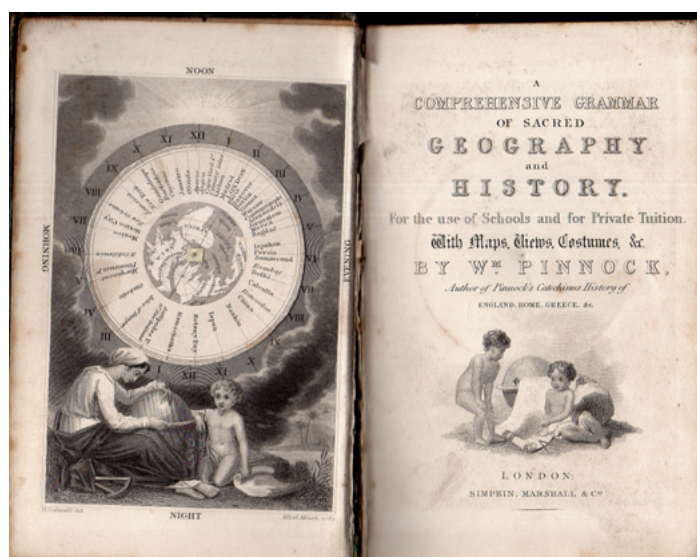


Fig. 5
a, b | W. Pinnock, *A Comprehensive Grammar of Sacred Geography and History*, London, Simpkin, Marshall & Co, [1830 ca].
Title page and volvella.

likely dates to the 1930s. The most plausible hypothesis is that it was published by Edizioni Labor or, even more likely, by Mondadori, which in Italy inherited the English *Children's Encyclopædia* (Fig. 6 a, b). This loose-leaf chart, referred to as a “little game” (*giuochetto*) in the promotional material, is credited to Giorgio Morrell, about whom I currently have no further information. This insert from the *Enciclopedia* is typical of another research area that deserves attention when discussing movable devices—namely, when such devices are “outside the book” and have a life of their own.

In our collection, we preserve a rotating planisphere titled *Quante stelle vedo questa sera*, which is a seventh edition, printed in Trieste by Editoriale Libreria (Fig. 7 a, b).

Fig. 6
a, b | *Giocchi scientifici dell'Enciclopedia dei ragazzi. Le meraviglie del giorno e della notte*, [1930 ca].
Title page and volvella.

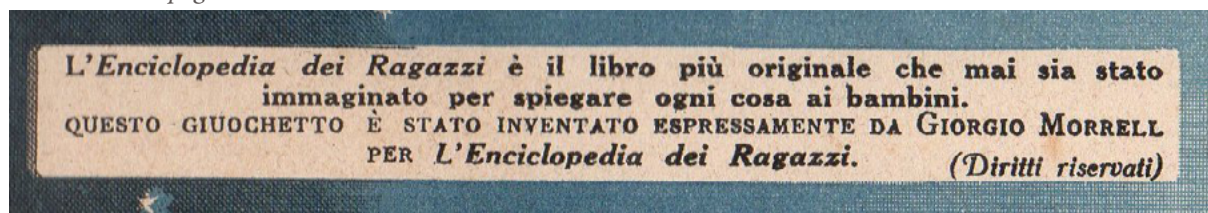




Fig. 7 a, b | A. Vital, *Quali stelle vedo questa sera? Planisfero girevole*. Edizione per l'Europa Meridionale, settima edizione, Trieste, La Editoriale Libreria, [1930s].

Consulting publisher catalogues was essential in this research – an indispensable source through which an in-depth study becomes possible. Thanks to the catalogues of the Paravia Historical Archive,⁵ it emerged that the volvelle printed on cardboard was in fact already being produced by Paravia in 1901, even earlier than Editoriale Libreria. The rotating disc was not only used to view the stars visible to the naked eye in the northern or southern hemisphere, but could also be helpful for navigation.⁶ The Italian example had European precedents dating back to the late 19th century. In London, around 1890, Philips' Planisphere was published by the firm George Philip & Son – a model practically identical to the Italian editions issued by Editoriale of Trieste and Paravia. That same year, the rotating planisphere also reached America, in an edition published in New York by Thomas Whittaker under the title *Whittaker's Planisphere*. On the back, in addition to the publisher's information and place of publication, the label “Made in Germany” indicates its origin, and indeed, the existence of a German version titled *Der Sternenhimmel*, published in Dortmund and attributed to bookseller A. Klippel, is well-documented: by 11 February 1894, it had already reached its eleventh edition. Moving from loose sheets to actual toys, one particularly interesting case is *Urania's Mirror, or A View of the Heavens* (Fig. 8).

It is a boxed set containing thirty-two constellation cards, first published in London by the editor Samuel Leigh in 1824, right around Christmastime, as a holiday gift: in fact, catalogues describe it as “an acceptable present,” so the aim was clearly to create an elegant product that would also

⁵ The historical catalogues are part of the Vigliardi Paravia Family Historical Archive, donated to the Tancredi di Barolo Foundation in 2015. As part of the project “A resource for schools” created with the support of the CRT Foundation and the Piedmont Region, the Foundation has made available a selection of historical catalogues of books and teaching materials, the only testimony on the century-old history of the Turin publishing house: <https://tinyurl.com/2xzts3a5>.

⁶ The Rotating Planisphere reappears in the School Supplies Catalog for Nursery and Primary Schools for the 1909–1910 school year, and again in the 1913–1914 edition, where the object's description is enhanced by an image showing the edition number: by 1913–1914, Paravia had already reached the fifth edition of Which Stars Can I See Tonight? In the Catalog of Mandatory and Recommended School Supplies for Primary Schools from 1924, the fifth edition is still listed, which indicates a marked slowdown in production (over the span of ten years, no new edition had been issued). A new edition appears to be in preparation, as indicated in the 1930 *Catalog of Materials and Publications for Geography and History*.



Fig. 8 || R. Bouse Bloxam, *Urania's Mirror, or A View of the Heavens*, prima edizione, London, Samuel Leigh, [1824]. Engravings by Sidney Hall. Box with cards and backlit cards.

perform well on the holiday market. Precisely because of this release at the end of the calendar year, some scholars date the first edition to the following year (1825). The lid of the box shows a depiction of Urania, the muse of astronomy. The illustrator was Sidney Hall, who hand-colored each card in the set, while the author⁷ of the work remains uncertain. There were two different editions of the cards. In the first, only the stars forming the constellation named in each card's heading were included, leaving the figures essentially isolated from the rest of the celestial vault; in the second edition, which followed soon after, additional stars from surrounding constellations were added.

The version we hold is therefore the first edition, as can be seen by examining the backlit image of the cards (Fig. 8 b), which highlights the exclusive presence of the stars forming each card's constellation. It is the first known example of the use of backlighting in an astronomical context: the cards are perforated with tiny holes for each star, giving shape to the constellation when viewed against the light.

Accompanying the card set was a book titled *A Familiar Treatise on Astronomy*, edited by Jehoshaphat Aspin. This publication went through four different editions, the last dating to 1834.

On this journey through rotating discs, star charts, and games, I now turn to a final topic directly connected to the technique of transparency—one through which I discovered an extraordinary figure: Franz Niklaus König (1765–1832), a Bernese painter active in Switzerland especially during the first two decades of the 19th century. The cultural context in which he worked

⁷ According to the testimony of Peter Hingley, bookseller of the Royal Astronomical Society in London, the author was almost certainly Reverend Richard Rouse Bloxam (circa 1765–1840), although according to some, it was an unidentified “woman” (possibly Reverend Bloxam's wife, Ann, sister of the portraitist Sir Thomas Lawrence). What is certain is that the illustrations on the cards of *Urania's Mirror* were definitely copied from Alexander Jamieson's *Celestial Atlas*, a highly curious, wordless celestial atlas from 1822 that enjoyed great commercial success, managing to appeal both to a scientific audience and to a more general group of amateurs. Jamieson was, in fact, not a professional astronomer but a teacher, and his background equipped him to balance scientific demands with aesthetic ones. A comparison between the drawings of Sidney Hall and those of Alexander Jamieson reveals a virtually perfect correspondence. It is therefore also plausible that the real reason the author chose to remain anonymous was to avoid possible accusations of plagiarism. We do not know what Jamieson knew or thought about Bloxam's *Urania's Mirror*, but it is hard to believe it was mere coincidence that in 1833 – just a few years after the publication of the *Celestial Atlas* – one of Bloxam's sons was a classical music teacher at Jamieson's private school at Wyke House. See P. D. Hingley, “Urania's Mirror – A 170-year old mystery solved?”, in *Journal of the British Astronomical Association*, vol. 104, no. 5, 1994, pp. 238–40.

was marked by a flourishing of optical curiosities and toys that foreshadowed modern photography. It was in this climate of great creative ferment that König began producing landscape views using the technique of transparency, enhanced with watercolor pigments. His romantic-inspired transparent paintings, large in format, were mounted in boxes or frames, then backlit and shown to audiences in darkened rooms. They were especially suited to depictions of moonlight, sunrises, and torchlight or firelight scenes.



Fig. 9 | F. N. König, [Kleiner Himmels-Atlas]: [in Einzelblättern]. Bern, 1826.
 (Universitätsbibliothek Bern., MUE Kp IV 246ht).

His works received widespread acclaim and were among the most renowned attractions of early 19th-century Swiss landscape painting.⁸ König used a similar technique for his transparent constellations. His *Celestial Atlas* (1826) (Fig. 9), still little known today, displays star constellations through a series of high-quality transparent plates, intended as a pedagogical tool to help young learners study the night sky.⁹ The atlas comprises twenty-seven numbered plates with lithographed star constellations printed in white on a black background. The reverse is covered with thinner paper, and along the side a strip is affixed, usually listing the constellation names beside the images and a brief description on the back. Each sheet can be held up to a light source (even at night, under moonlight) to distinguish the arrangement of stars forming the constellation. In this way, the viewer can walk beneath the stars with the celestial map in hand and, by its light, bring the night sky to life. König's star charts were created at a particularly interesting moment in which celestial maps – based on telescopic observation – were becoming increasingly crowded with stars, leaving less space to depict the traditional mythological figures of the constellations. To conclude this survey, I have chosen to highlight a typical case of “emergence” found in discussions of amusing science: a one-of-a-kind item, an astronomical game – *Loto Astronomique* (Fig. 10). The game consists of a box containing twenty-four game cards on which the names of constellations and their respective figures are printed in white. The bingo-style numbers are shown in white, with the corresponding Greek letter spelled out below; inside the box is a large blue fabric pouch containing wooden tokens printed with numbers in black on both sides, and a smaller blue pouch holding cardboard stars (gold on the front, white on the back) and bone

⁸ The [Goethezeitportal](https://www.goethezeitportal.de) publishes several of the much-admired transparent paintings, reproduces the review by Goethe and Meyer, and supplements it with other testimonies, including a short biography of König. Since the paintings—mostly featuring popular Swiss motifs—were highly appreciated, König opened a “Transparent Cabinet” in his apartment in Bern in 1815, exhibiting eight large-format paintings. Public attendance at his shows grew significantly, to the point that he was encouraged to present his art in various cities in Switzerland and southern Germany, including Munich, Augsburg, and Frankfurt. Later, his tour also took him to France. In Weimar, he gave a private performance for Goethe. Goethe and Meyer, Weimar art enthusiasts, favorably reviewed the innovation in the journal *Über Kunst und Altertum* (1820), and König, along with the associates who continued the “Transparent Painting Cabinet” after his death, used this review for promotional purposes. Contemporary reviews discussed the artistic value of the invention, as well as the nature of the colors and light and their role in painting.

⁹ Universitätsbibliothek Bern, MUE Kp IV 246 <https://doi.org/10.3931/e-rara-91508>

counters. The aim of the game is to help children learn the names of constellations, encouraging them to recognize them through the figures, all while having fun.

A particularly interesting and little-studied context is the musical one, in which games, movable devices, and interactive books are often used as music education materials. The topic has recently become the focus of research within our Centre, and the first results are presented in this same issue of *JIB*.¹⁰



Fig. 10 || *Loto Astronomique*, a.l., [1880 ca.].
A French-made game containing 24 cards featuring the constellations of the zodiac.

¹⁰ Cfr. Roberta De Piccoli and Pompeo Vagliani, 61-72.

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