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An Anatomy of Movable Delights:
Analyzing selected 18th -21st century interactive books from a comparative media approach

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ABSTRACT

This essay derives from a keynote talk given virtually at the Foundation Tancredi di Barolo in Torino as part of "Pop-App" an international conference on the description, conservation and use of Movable books, held between 16-19 February, 2021. The conference was organized by Professors Vagliani and Crupi, and had been planned for February 2020 but postponed a year and held online due to Covid. The conference was a great success. The switch to virtual mode enabled more people to present and attend globally and raise provocative questions about movable books and moveable media generally from different perspectives. The occasion of the conference and writing this essay has prompted me to push my thinking about movable books forward in two ways. It has enabled me to think more about contemporary movables, especially pop-up books, in a cross-cultural and cross-linguistic manner in light of earlier books. It has also spurred me to return to, rethink and re-apply ideas of key comparative and new media theorists, particularly the work of Noah Wardrip-Fruin on his anatomy of player effects based on computer gaming that I adapt to interactive paper media.

KEYWORDS

Interactive books, movable books, comparative media

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The subject of this essay is an anatomical analysis of key examples of movable books from experiments in two and three dimensions in the late 18th and 19th centuries until the present-day. I include books from England, Germany, America and Italy in the survey. My approach uses a historical overview with comparative and new media theory in order to demonstrate how illustrators and designers exploit movable formats that create specific effects for the children who engage with them and, due to the exigencies of space, I select only a few examples from each period across a wide time span.

This essay has several parts. The first section provides a theoretical contextualization of the examples to be discussed. The next section concerns late 18th and 19th century experiments in two and three dimensions. The following section discusses the 20th century pop-up book, in the prewar and intrawar period. The final section analyzes modern and postmodern experiments in the design of movable books and pop-ups. Throughout I argue that since movable books are interactive, narrative media on paper platforms they may be understood by adapting ideas from comparative media theory.

Theoretical Approach

My discussion is supported by some key concepts I have adapted from book historians and comparative media theorists, particularly Clive Hurst, Janet Murray, Noah Wardrip-Fruin, Henry Jenkins and Jay David Bolter and Richard Grusin. A key idea is that movable books are hybrid objects –part book -usually of words and pictures-- and part game and/ or toy (Hurst 1995, preface). Accordingly, a reader of a movable book is also a viewer and a player. I adapt the idea of an interactor: or a player of digital game to this role. (Murray 1997, 78–79; Reid-Walsh 2012). Janet Murray distinguishes the term interactor from user who is doing a utilitarian task such as setting an alarm clock (Murray ibid).

Following Murray I distinguish between "activity" and "agency" in book- game play. "Activity" allows an interactor to choose from a set of alternatives, or spin a dial to produce actions and their effects. An exam-

JIB.org I, 1 (April 2022)

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ple is snakes and ladders. These busy actions are not related to a player's intentions. By contrast "Agency" is when a player achieves autonomy by making selections from a wide range of choices and so determines the course of events; and can be an aesthetic pleasure. The example she provides is chess (Murray 1997, 128-91).

Again, following Murray, I draw on theories of affordances adapted from cognitive/ perceptual psychologist James Gibson in 1977. He uses the word to refer to a wide range of "action possibilities" perceived by animals and humans based on the physical properties inherent in an environment, as well as the objects located in the environment. Murray uses the term as a synonym for "properties" (Murray 2012, 410). This enables me to ask overarching questions about any media text: what does the design allow a reader-viewer-player (or interactor) to do? what are the constraints?[1]

The next concepts are adapted from digital game designer and theorist Noah Wardrip-Fruin creates an anatomy of game effects. In his *Expressive Processing* 2009 he proposes that computer games fall into three broad categories. I extrapolate less from his witty titles based on the names of three important early computer games but from his descriptions and apply them to moveable books. The first effect is called the "Eliza Effect" based on a game where a player engages with a simulated therapist answering and asking questions. This effect refers to how audience expectations allow the digital media system to appear much more complex on the surface than it actually is as supported by the underlying structure. This illusion becomes apparent only when a player engages thoroughly with the game (Wardrip-Fruin 2009, 15). The second type of effect, he dubs the "Tale-Spin Effect," is opposite to the "Eliza Effect." It is named after an important story generation game in which characters have goals, make plans, examine their relationships with one another, and so on (Ibid.). Wardrip-Fruin uses this term to discuss media games that give an illusion of simplicity. Paradoxically due to an opaque interface, no amount of play with the system will allow insights into the processes at work (Ibid., 146). He observes that since the interactor can never discover the design of "Tale-Spin," the play experience may come across as repetitive and ultimately the player may become frustrated with the game.

The third effect Wardrip-Fruin proposes is the "SimCity" effect, named after the city-planning game where designers make a fairly complex system into a rich play experience (Ibid., 16). Here the design of the game is visible or transparent on the surface, so playing the game actually teaches players the basics of its construction. He observes that this teaching may occur in simple spatial-simulation games, such as Pong (ivi., 308), or in complex games, such as The Sims games, in which one first designs a city and then characters in its neighborhoods (Ibid., 316).

Wardrip-Fruin's ideas have been applied to researching and making computer games that incorporate Artificial Intelligence. For example in "AI-Based Game Design: Enabling New Playable Experiences" by Mirjam P. Eladhari et al, 2011, the authors adapt the definitions to their own context, considering the first effect to be only "smoke and mirrors" although they acknowledge that it enables "exploring new forms of play experiences and experimenting with new game genres" (Eladhari. 2011, 1). Regarding the second, the Tale-Spin effect, the opposite issue occurs. They say that if the game design is not shaped by the AI design, "the player is unable to see or understand the operation of the underlying AI system" thereby not

[1] These questions can be made more complex and sophisticated with reference to the structure of the book/game. In "agency reconsidered' Noah Wardrip-Fruin, Michael Mateas, Steven Dow, and Serdar Sali extend the idea of affordances beyond a purely functional usage (Wardrip-Fruin et al. 2009 ,3. They distinguish between different kinds of affordances of that may be placed in tension with one another: while the structure of the game or "material affordances" may provide a wide set of actions, the dramatic requirements of the plot or "formal affordances" may strongly encourage certain specific actions, thus narrowing the range of actions by the interactor (Reid-Walsh 2018,18). This is a useful idea to apply to analyzing movable books.

JIB.org I, 1 (April 2022)

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understanding the complex effect of the AI (ibid., 3). They propose that the third effect, the SimCity effect "leads to players being able understand the operation of the system, which can only be found if the game design is informed by the affordances of the underlying system in our case the AI. The game must be designed in a way that allows players to reason about the actions of the AI such that they can read meaning into the AI's choices" (Ibid.).

Here I focus on the story game aspect of movable books and consider how child and adult interactors playing with the books may understand the design and format processes at work. I apply Wardrip-Fruin's anatomy of effects to different kinds of interactive paper media organized chronologically. In my approach I use the key descriptors of the three design effects. The first then is an effect that creates an illusion of complexity but is actually quite simple, the second is an effect of an illusion of transparency, but is of opaque design, and the third is of a transparent design, whether simple or complex. Here a player learns the design features by engaging with the media text. Although I organize the examples chronologically, I do not consider the three design approaches in a developmental way, extolling one over the other.

Since I employ a historical media approach, I use the term "remediation" adapted from a key pair of comparative media thinkers, David Bolter and Richard Grusin from their influential book *Remediation.* They contrast their understanding of the term in relation to an earlier usage devised by Paul Levinson (1997, 104–14). Levinson applied the concept of "remediation" to what he called an "anthropotropic" process that approached earlier technologies in a linear developmental way. Simply, remediation was a process that "improved" or remedied the faults of earlier media (Bolter and Grusin 1999, 59 n. 9) . In contrast, Bolter and Grusin define their use of remediation in a nuanced way as "the formal logic by which new media refashion prior media forms" (Bolter and Grusin 1999, 273). They include technological and cultural aspects of remediation, which can be understood in physical, social, aesthetic, and economic terms. New media technology is not then, as commonly understood, only providing new hardware and software, but is forming and reforming a network. Citing the World Wide Web as an example, they observe that it is not simply a software protocol but also the sum of all its uses (Bolter and Grusin 1999, 21).

When applied by media scholars such as Henry Jenkins, remediation has specific applications to old and new media that I apply to movable books as hybrid paper media. Jenkins works mainly in reference to new media such as in his influential *Convergence Culture* (2008). Yet he always takes a long-range view of media-in-transition across long time frames. For example, he and co-editor David Thorburn, in their introduction to *Rethinking Media Change: The Aesthetics of Transition* (2003) propose a complex model for understanding media change. Using a non-developmental perspective where new media do not destroy old media they argue for the principles of continuity and transformation where collaborative and hybrid forms may emerge during times of change. For instance, they refer to the early example of the Bayeux Tapestry (ca. 1067–1077) that they approach as a bridge between oral and scribal cultures due to the combination of text and images and it being explicated in sermons. They similarly include contemporary experiments in storytelling that combine computer games or web-based environments and draw on familiar book, television, and film genres (Thorburn and Jenkins 2003, 3). To explain this continuous process of media change, they use the concept of "remediation" as a means of enabling old media and new media to inform one another.

I apply the term as a way to approach movable books across a wide time span. Many are based on and formally reworking and rethinking earlier narrative stories on different media platforms to a contemporaneous audience (Reid-Walsh 2018, 14-15). As seen below these include popular theatricals in the 18th century harlequinade turn-up books, classic film in some early 20th century movables, and classic children's stories including fairy tale retellings in 19th, 20th and 21st century complex movables, especially pop-up books.

JIB.org I, 1 (April 2022)

DOI: https://doi.org/10.57579/2022JIB008JRW

JIB Journal of Interactive Books

18th and 19th century experiments in two- and three- dimensional design

In a presciently titled, short but important essay directed to a broad readership called "Books that Come to Life," (1975) the famous British collectors and scholars Ionia and Peter Opie propose a secret to the success of movable books. They say that movable books (or, to use their terminology, "mechanical books" used in a broad sense) "lies in their ability to surprise" based on the "ingenuity" of how the "bookish format conceals unbookish characteristics" (Opie and Opie 1975, 1055). They acknowledge that "to the connoisseur, the golden age of the mechanical book was the second half of the nineteenth century" (Ibid.). Yet their essay moves back in time to discuss much earlier examples starting with the 16th century scientific books, rests a bit on the 18th century turn-up books, before settling on the late 19th century elaborate movables. My research circles in and around their provocative statements, particularly the idea of the title where books appear to have their own energy and agency, the idea of a movable format hiding in a conventional book-like appearance, and a historical approach to movable books, especially those for children.
To many people movable books especially for children began in the later 19th century. Indeed, the rapid improvement of paper technology during the 19th century, particularly during the late Victorian period, resulted in a large number of innovations in movable books in England and Germany such as the use of moving parts to achieve an effect of "animation" on two-dimensional and three- dimensional planes. Yet there are important precursors achieved remarkable effects without using extra movable parts. One major type is the turn-up book or harlequinade book or metamorphic book. Below I briefly discuss this kind of book focusing on the transformation effects of a well-known example. This links them to the Dean and Nister movables, although the effects were achieved by different means.

18th century harlequinade turn-up books: transparent design

First, I answer some key questions: What are harlequinade turn-up books? How are they related to children? In British culture the term "harlequinade" means several things. First It refers to key sections in a pantomime performance based loosely on the 16th century Italian *Commedia d'arte* characters. According to an online article "The Story of Pantomime" on the Victoria and Albert Museums website, by the 18th century the plots were based on classical tales set to music but without speech. The character Harlequin was the romantic hero of the shows, the most notable early harlequin being John Rich who also devised the harlequinade a comic chase scene featuring harlequin, and Columbine being thwarted by her father and pursued by Clown. The article notes that the word "slapstick", meaning a certain type of clownish physical comedy, came from Rich's Harlequinades. His depiction of harlequin used a wooden bat to change the stage scenery by knocking down a series of hinged flaps[2].
All ages and classes of society attended the pantomimes, especially the young apprentices who came at half time for half price (O'Brien 2004, 142).
A related meaning for the term harlequinade is small booklet that was a 'tie-in' to the stage productions. Scholars George Speaight and Brian Alderson (2008, 89) state that the harlequinade booklet was the first substantial attempt to exploit stage productions in print. Significantly the booklet has a distinctive format. In *The Treasures of Childhood Books: Toys and Games from the Opie Collection*, Iona Opie, her son Robert, and Alderson describe how harlequinades were printed on an engraver's press on two, identically sized

2 See the Victoria and Albert museum online article "The Story of Pantomime" about the history of pantomime https://www.vam.ac.uk/articles/the-story-of-pantomime

JIB.org I, 1 (April 2022)

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JB Journal of Interactive Books

sheets of paper. One was laid on top of the other and secured along the top and bottom edges. The top sheet was divided into (usually four) panels, which can be turned up to reveal appropriate (or inappropriate) combinations (Opie 1989, 50). (Ibid., 51). These engraved strips were printed at two price points -in black and white for one price and hand colored at a higher cost (Ibid.) (Please see price on example shown below.) A further use of the uncolored version could be as a make-shift coloring book in the modern sense. The core of the theatrical harlequinades and book harlequinades was visual spectacles of antic transformation that fueled the action of the plots (Mayer 1969, 5). In pantomimes the spectacular changes were called "transformation scenes" where the key characters were transformed into the commedia characters (OED). In the turn-up books these were reworked into the text as changeable images (Speaight 1991, 70–71).

A doggerel rhyme is placed above and/or below the images and the combined words and images can be read only when a reader/viewer manipulates the flaps in a certain order. It is moreover a playable object, since instructions for use are incorporated into the verse; often the phrase "turn up" and/ or "turn down" are stated, even paratextually.

As mentioned above, in early pantomimes harlequin had an active role in achieving the transformations using his wooden bat as a mechanism to change the stage scenery by knocking down a series of hinged flaps. In terms of connecting the stage harlequinade to the remediated turn-up text, it is important to note that in the turn-up book the flaps are the mechanism for transformations but enabled by the interactor.

The British printer most associated with the format was Robert Sayer. He took a moveable paper strip, connected with a 17th century "cheap print" religious text and "repurposes" it (Bolter and Grusin 1999, 45) for different ends. The small harlequinade books are miniature remediations of the plot, tricks and scenes so by playing with the flaps and strip an interactor receives a sense of attending the performance (Reid-Walsh 2018, 102)[3].

To illustrate how the illusions work I include several images from a popular harlequinade turn-up book *Harlequin Skeleton* 1772 (**Figs. 1, 2, 3, 4**).

Here the illusion of change is created by apparent movement in two figures. There are two types of animation created by different means. The focus on the reaction of Clown is broken down into stages so that when an interactor lifts the flaps Clown's body becomes animated part by part. Because the Harlequin is restricted to the upper flap, his animation is achieved by placing slightly different poses, one over the other, so that when an interactor lifts the flap up, the skeleton apparently pops out of the closet. As both characters appear to move downstage towards the reader-viewer-player this may evoke the "startle effect," a term used in cinema studies .(Baird 2000, 13). The slightly extended depiction of movement recalls that of early comic strip film or several flicks of pages in a flick book (Reid-Walsh 2018, 103).

As shown in the images from *Harlequin Skeleton*, Harlequinades exploit the affordances of the simple yet effective design of movable flaps and accordion folded strip. An interactor of a harlequinade turn-up book assumes different roles both as a critical spectator and as a producer of the show. Each time an interactor engages with the usually four-part strip a slightly different performance can be staged. With *Harlequin Skeleton* for instance, one could play the animation in reverse by having skeleton go back and come out of the closet for a greater absurd effect. In this way an interactor becomes a producer or creator of the performance itself (Reid-Walsh 2018, 104)[4].

Since playing with a turn-up book reveals the "how" of the design strategies, the small, inexpensive, simply designed harlequinade turn-up books are excellent instance of transparent design, or what Wardrip-Fruin

[3] See Reid-Walsh 2018 ch. 4 for an extended discussion of the harlequinade turn-up book.

[4] For clickable images of Harlequin Skeleton with all flaps closed and open see http://sites.psu.edu/play/imagegallery/1772-harlequin-skeleton/. Note the two prices stated on the first panel.

JIB.org I, 1 (April 2022)

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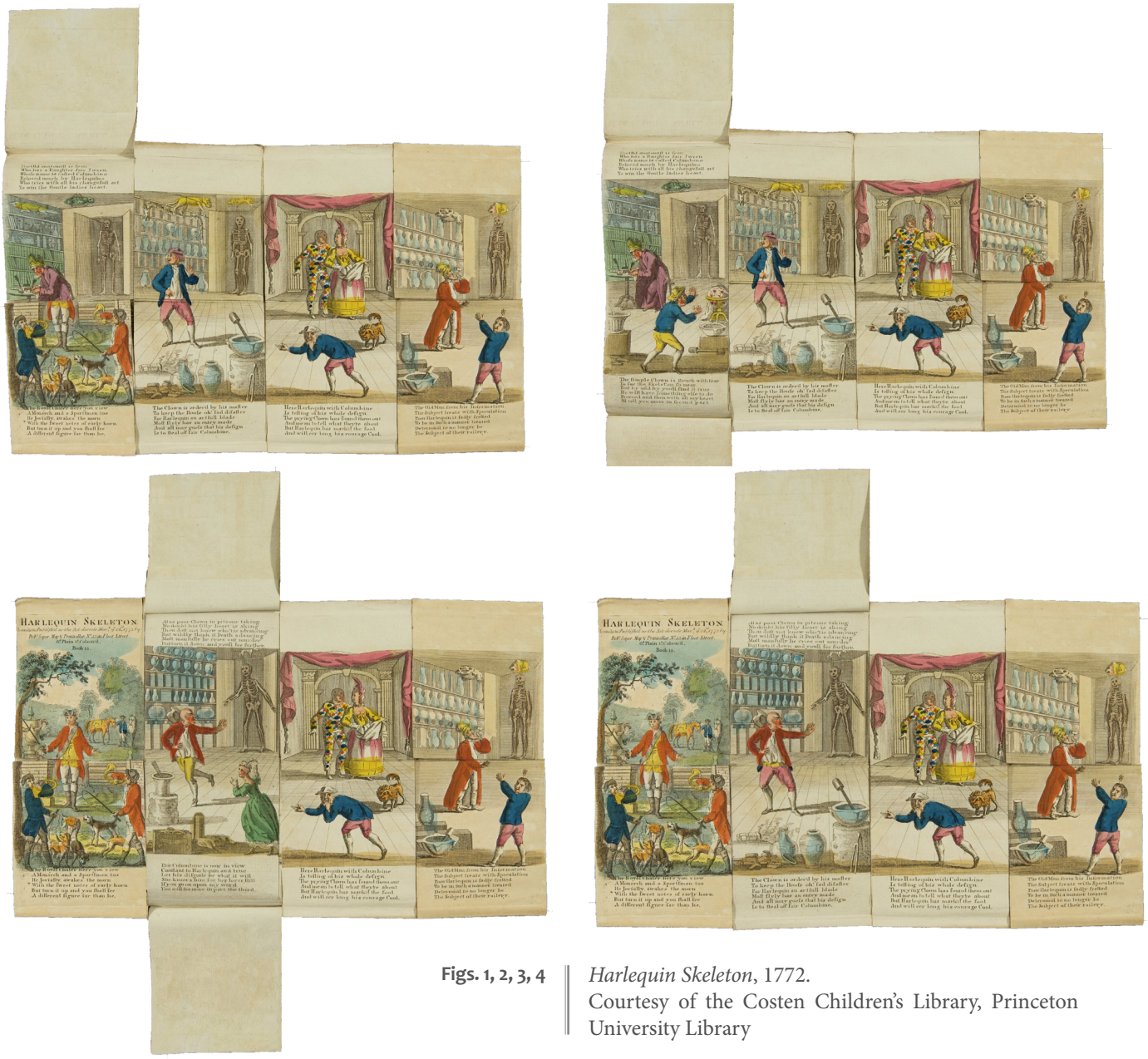
JB Journal of Interactive Books

calls the "SimCity" effect.

That so many harlequinade chase scenes are set in cities is somehow apt! With the movables of the 19th century an interactor plays a different role in precipitating transformation effects. As I discuss below an added device of a tab becomes the mechanical means of creating a change.



Figs. 1, 2, 3, 4 | *Harlequin Skeleton*, 1772. Courtesy of the Costen Children's Library, Princeton University Library

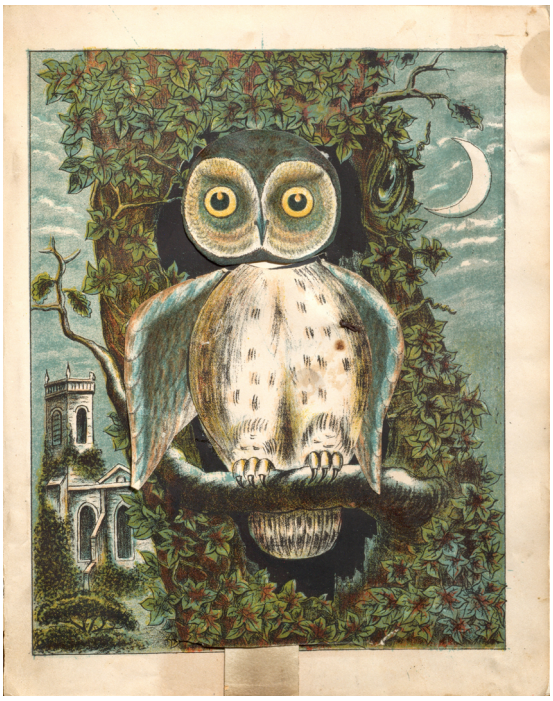
19th century two-and-three dimensional Victorian books: opaque design

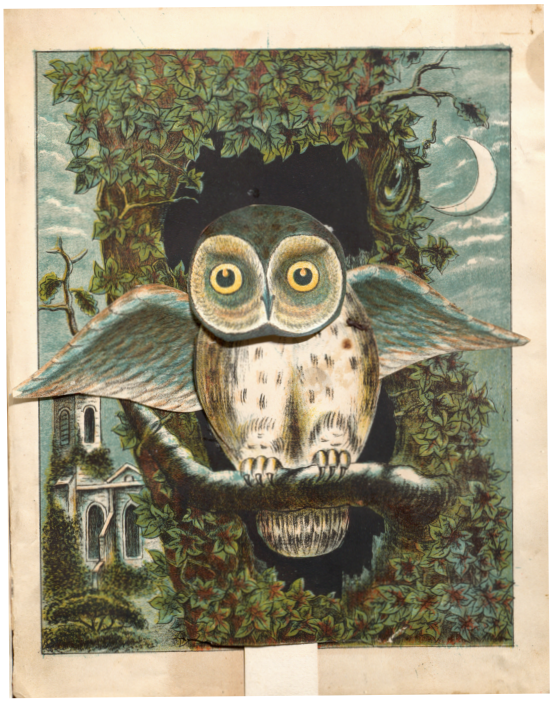
The first Victorian experiments in movable books proper worked in two dimensions using devices such as tab and slat (which moves like a venetian blind), and tab and volvelle (or dial). With the first type, pulling a tab enables the slats to move up or down over one another to transform the scene and these are called "dissolving views" (McGrath 2002 ,24). Using terms from pre-cinema Eric Faden refers to the transformation as creating a "dissolve like effect" (Faden 2007, 75). With the second type, pulling a tab creates "revolving

JIB.org I, 1 (April 2022)

DOI: https://doi.org/10.57579/2022JIB008JRW

JB Journal of Interactive Books





Figs. 5, 6 | *Moveable pictures in Feathers & Fur*, 1880. Dean & Son. Courtesy of Special collections, McGill University Library

scenes" (ibid).

In Britain several firms claimed to have produced the earliest genuine movable book. As Tessa Rose Chester discusses in her bibliographic essay about the Renier Collection at the Victoria and Albert museum, two British firms, Darton & Co. and Dean & Son, both claimed to have produced the earliest children's movables (Chester 1988, 2–5). Leslie McGrath resolves the dispute by saying both firms in 1856 created two important books: *Book Of Trades* and *Cinderella*, respectively while Raphael Tuck's novelty book firm was established in London in 1770 (McGrath 2002: 16-24).

Beside are images (**Figs. 5, 6**) from innovators in moveable books that use the mechanism of the paper tab. First is a tab and slat design and the second is a tab and volvelle. The first pair of transforming images is that of the owl from *Moveable pictures in Feathers & Fur* Dean & Son (circa 1880). When you pull the tab at the bottom of the pages the action causes the owl to out stretch his wings[5].

Ernest Nister, like Tuck, established his movable book firm in London in 1870. He specialized in two-dimensional illustrations like the revolving transformation using volvelles. These consisted of two pictures that were sliced into sections and interleaved. The two layered illustrations could be pulled with a tab that slid the upper picture aside to reveal the lower one. Those featuring abstract designs are called "kaleidoscopic" volvelles and those with centers that act like a camera lens are called "iris volvelles" (Mcgrath 2002, 24). The second pair of images from the online Osborne Collection are from *Something new for little folk* with verses by Clifton Bingham. The online images show the transformation from abstract decoration to tranquil scene (Ibid., 26)[6].

The apotheosis of these kinds of integrated design was achieved by German artist Lothar Meggendorfer who created what is known as the "mechanical book". These have internal components riveted together by copper wire hidden within two pages of the book and operated by a tab (Ibid., 27). This combination of the pull with complicated internal mechanisms created integrated multiple movements in two dimensions and on occasion in three dimensions through small "stand-up" effects. As Iona and Peter Opie remarked, "To the connoisseur, the

[5] For turning the page images of the entire book see https://archive.org/details/McGillLibrary-rbsc_bourke_movable-pictures-feathers-fur_PZ83M871880-20546/mode/2up .The owl is the last sequence. Significantly, the final page shows the construction technique for the movable parts.

[6] For an image see the Osborne Children's collection online at https://static.torontopubliclibrary.ca/ve/magicbook/home.html.

JIB.org I, 1 (April 2022)

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golden age of the mechanical book was the second half of the nineteenth century".
The following image is from *Look at Me* (1891), one of Meggendorfer's masterpieces, from the middle of a three-part sequence about St. Nicolas incipient arrival. The apprehension of children is depicted in the contrast between the moveable and static images.
This image from the middle of the sequence shows the children hiding behind the door, then the door opens, pushed by St. Nicolas's arm, and he appears with his cane. The final image in the set (not shown) depicts St. Nicolas making a flourishing entrance -with a bulging sack. Indeed, as Maurice Sendak remarks in his appreciation in a moveable book devoted to Meggendorfer, the progression makes the pictures "come passionately to life" (Hunt, 1985 np). The effect is as if an invisible puppeteer in the book carries out actions –Indeed the energy seems transferred from the human to the book![7]

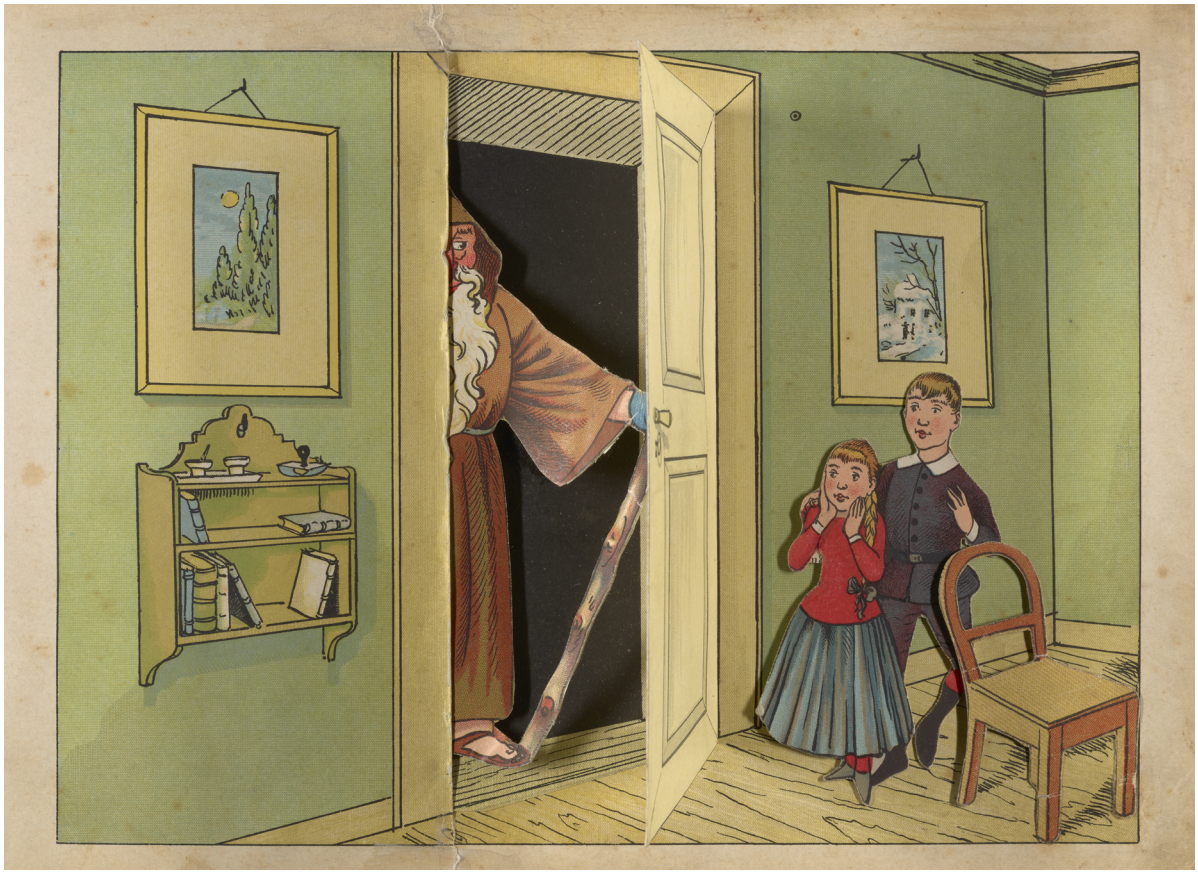

Fig. 7 | *Look at Me: A New Movable ToyBook*, 1891.
Courtesy Special Collections, The Pennsylvania State University

It is important to note that the tab (or edge of the disc) is a prosthetic device that the child uses to cause the action. I consider it a prosthetic device, since it supports and enables a person to manipulate objects in ways otherwise not possible. With the slat and tab design, the roles resulting from the interaction are somewhat paradoxical: by pulling the tab, the interactor instigates the action but has no control over the outcome. I interpret the relation between child and the book to be that of a catalyst. The child is the enabler of the action and provides the impetus, but the movements are performed by the book's internal mechanisms. Since an interactor is placed at a distance physically and aesthetically from the animation he or she is situated more as an interactive spectator. Here an Interactor is a catalyst of repeatable animations:

[7] For a bibliographic description see https://catalog.libraries.psu.edu/catalog/1965351.

JIB.org I, 1 (April 2022)

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(activity) but has no control over the actions (agency). Initially for an interactor this separation may increase a "startle" reaction.

The two-and three-dimensional tab operated books, especially those by Meggendorfer with complex mechanisms hidden between the pages, to be instances of increasingly opaque design, or what Wardrip-Fruin calls the "Tale Spin effect." The surface of the pages hides an inner complexity; since the devices are hidden in thick pages, a person cannot determine how the book works by sight or touch-although they yield tantalizing hints. No amount of play will allow insights into the processes at work, unless you destroy it (Reid-Walsh 2018, 204).

Indeed, Meggendorfer captures this situation well in the introductory poem to *Look at me!* 1891. The poem is spoken in the voice of the book to the child and seeks to educate readers how to engage with the book:

Turn my pages tenderly,
Move my pictures carefully
"Look at Me"! enjoy my fun,
And put me back when you are done. (np)

The poem self-referentially hints at the perils of opaque design.

Carefully touching the surfaces provides some hints but the secrets of the object are not revealed. Since the interactor cannot see nor touch the enabling devices, the play experience must have been both fascinating and frustrating for a child. Many books are destroyed through play and this is the lesson the book teaches us in Meggendorfer's poem.

Movable book designs: complex 20th and 21st century experiments in two- and three-dimensional books

In this section I discuss a few key modern and contemporary movable books across the historical space of the 20th and 21st centuries. In adapting Wardrip-Fruin's ideas about three kinds of effects experienced by interactors I use a combined approach as well as extend his anatomy to include reverse effects. The books I analyze are all complex constructions created by artists and designers with a playful, sometimes self-reflective or ironic tone. First, I briefly discuss the term pop-up, second I analyze examples by intra-war creators: Louis St. Gerard and Tony Sarg who pushed the design thinking of pop-up and movable books forward. Then I analyze several contemporary experimenters: Bruno Munari, Robert Sabuda and David Carter. In so doing I analyze examples that push the limits of two and three-dimensional design effects. The creators explore features of transparent versus opaque design, and ideas of simplicity versus complexity in different ways. Accordingly, the design effects become more mixed mode and multimodal for interactors to engage with.

Pre-war and intra-war experiments

As Rosemary Temperley has shown, the term "pop-up" was used as early as 1912-14 by a British publisher Chad Valley Toys of Harborne Birmingham England. Called *The Pop-up book with original Rhymes and Drawing*s the small book measures 17x12 cm and the pop-up uses a rubber band with a spring action to achieve the effect (Temperley 2009,3). The term was later copyrighted by Blue Ribbon Publishing with Disney in 1933 (McGrath 2002, 32).

It is important to note that the term "pop-up" does not define a specific construction technique but rather a book where when opened certain elements of the page rise up to then sink back when closed (Missiroli

JIB.org I, 1 (April 2022)

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JIB Journal of Interactive Books

2020, np). Therefore, it is important to note that without using the term, French write Pierre Delacourt's *Jack in the Box* published in 1905 although called an "album of surprise images" is a pop-up book (Vagliani 2019, 66, Fig. M7.1). Vagliani links this French edition back to Dean & Son's contemporaneous book of a similar title *The Jumping Jack in the Box* in their *Magic Surprise* Series (Crupi and Vagliani 2020, 163). Researchers need to be mindful of this when searching for early examples of this kind of book and use a broader set of terms.

Between 1929-1949 publisher S. Louis Giraud produced inventively designed and inexpensive stand-up books in his *Bookano* Series. Called "living models" Giraud with Theordore Brown an inventor of optical entertainments created a design that stemmed from how the images sprang up when the book was opened. This was due to the building of "V" folds into the structure of the book (McGrath 2002, 31). When an interactor opened the pages, the "models" opened and moved toward him/her as with a "jack-in-the-box" toy. There was no tab, opening the book caused the illustrations to spring up. The page-activated, 360-degree, 3-dimensional paper constructions became the first true 'self-erecting' pop-ups (Montanaro 2001, 13).

Examining the books, the inventive dimension is remarkable. Giraud and Brown worked with the available poor quality paper but created advanced and inventive paper engineering to perhaps counter the war limitations. After ninety years the mechanisms still work smoothly (Richard Virr, May 31, 2021 [personal communication]). The design is opaque since the structures are hidden in the pages.

In all cases, as with the Old Mother Hubbard pop-up, the act of turning the pages cause the images to spring up and sink back down. In terms of playability, since the book is an Interactor it is the catalyst of the action but the movement is by the book itself, an unaware player does not know where the pop-ups are hidden within a large volume so the encounter may create a "startle" effect.

As the table of contents' pages indicate, the pop-ups are separate aspects in the book. They not only illustrate a story, but also develop their own pop-up narrative. In the front of each book, the wizard Bookano addresses the child reader in bald verse. The poem in the first volume aptly describes the technique of "bringing live pictures before you at will" with "models that rise"; and then the effect: "You'll have all you can Do? / To believe your own eyes.[8]"

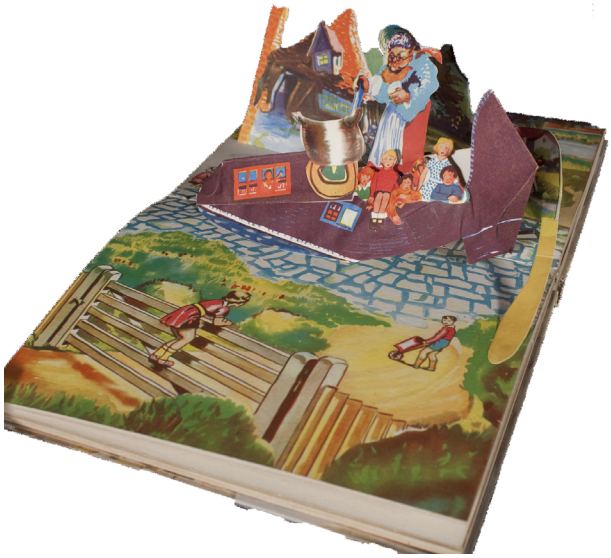

Fig. 8 "Old Mother Hubbard" from *Bookano Stories* 1934. Courtesy of Special collections, The Pennsylvania State University

In contrast, a few years later in a more affluent America, Tony Sarg was experimenting with two-dimensional de-

[8] Due to paper supply during the war, the Bookano books were made of cheap paper, and were inexpensive, novelties sold in penny bazaars. They included complex mechanicals but the thick, stiff paper, had muddy colours of illustrations, and imprecise die cutting. This started a trend for more affordable movable books (Montanaro 2001, 13). Examining several books in the McGill University collection reveals the brilliant design and immediacy of the pop-up effect. For example, er the 1934 set titled Bookano Stories: With Pictures that Spring Up in Model Form, is housed in special collections at McGill Library. In one of the set's volumes, the contents page only describes the assemblage as "stories and verse for Boys and Girls of all ages" with "coloured pictures that spring up Lifelike as the book is opened" (Giraud 1934, vol. A n.p.). The design indeed achieves such an effect. Each volume is a word and pictorial miscellany containing a number of stories with line illustrations, verse, stories without words, colored pictures, and about six "coloured stand-up models" (Giraud 1934, vol. 4 n.p.).2

JIB.org I, 1 (April 2022)

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sign and multisensory books to create complex interactive books. In *Tony Sarg's Magic Movie Book* (1943) Sarg provides different kinds and modes of playful engagement for an interactor to choose from and combine. His books reflect the popular culture of the period and his skill as a puppeteer and animator[9]. This book includes film- based toys like "magic glasses" and a kind of "viewmaster toy" (toy invented 1939) with a revolving disc. Sarg provides an interactor with agency by being able to play with the different sites in and on the book by putting on the 3 d glasses, notably in different colours, and moving the edges of the viewmaster. By these means, an interactor can create a kind of mechanical (3D) cinema.

In his interactive designs Sarg remediates traditional tales but does so with a droll modern twist. The plots have active heroines, the illustrations are cartoon-like and the design uses contemporaneous toys. At the same time playing with these create pre-cinema effects hearken back to earlier examples of movable book experimentation. The juxtaposition of classic tales, often a traditional girl-centered fairy tale and on the other a typical boy-centered folktale can be seen in the photos from one two-sided disc. *Cinderella is* on one side and the *Three little pigs is on the back.* Other paired examples are "Jack and the beanstalk" and "Rumpelstiltskin" ; "The Three Bears" and "Red Riding Hood" and "Sleeping Beauty" and "Chicken Little". Sarg includes poems as well. By making their own movie production an interactor makes their own modern 'mash-up' tale.[9]

Since the pages are falling apart –we can see how the volvelle worked and learn how the central metal eyelet would have been attached to the wheel. The disc was inserted between the pages and had a projecting edge. By moving this edge an interactor can create and control the moving images, so achieves some agency by being the motor of the film. The interactor is also a spectator. However, playing does not reveal the design for the device when intact has opaque design[10].

Contemporary interactive books and pop-ups: testing the limits of a book and an interactor

With the complex movable books examined so far, the books are of opaque design. In the contemporary period some writers, illustrators, designers and paper engineers create playful, ironic or self-reflective books that challenge our ideas of what a book is and who a reader-viewer-player or interactor is. They also challenge an attempt at classification. Here I discuss three book experiments by Bruno Munari, Robert Sabuda, and David Carter, ending with Carter's remediation of Munari sculptures as a pop-up book.

Sometimes their books can be approached by adapting Wardrip-Fruin's ideas to paper media. For example, Bruno Munari on occasion creates visual effects that could be analyzed as creating material versions of the "Eliza Effect" by making artifacts that are so radical in their simplicity that they appear complex as in *Prebooks/I Prelibri* (1980) Corraini, (2011) discussed below. Munari tweaks and inverts the effect too since the process of engaging with them is extremely complex[11].

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[9] Due to copyright I could not obtain images of *Tony Sarg's magic movie book : in collaboration with Emery I. Gondor ; ten tales that will never die*, Greenberg, 1943. See catalogue entry for the copy I examined at The Pennsylvania State University: https://catalog.libraries.psu.edu/catalog/1933549. For an image of the book with the viewing glasses see the online exhibit at the University of Utah at https://www.lib.utah.edu/collections/rarebooks/exhibits/past/ffppp.php.

[10] Leslie McGrath p. 34 item 42 describes how Sarg also experimented with multisensory books such as *Tony Sarg's surprise book: look, listen, small, taste and feel: open this book—it will open your eyes—for each of your senses it brings a surprise*. New York B.F Jay 1941. Please see an image on the Osborne Children's collection online at https://static.torontopubliclibrary.ca/ve/magicbook/home.html. For a moving image please see the website at the University of Utah given above.

[11] For a photo of the complete set of Bruno Munari *Prebooks / I Prelibri*. (1980) Corraini, (2011) please see the website of the Fondazione Tancredi di Barolo: https://www.fondazionetancredidibarolo.com/fondazione-tancredi-di-ba-

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These are a set of twelve 10x10 cm "object books" small enough to fit into a child's hands and easily browsed and touched" (Campagnaro 2019, 91). They are intended to be engaged with by very young children before they can read. The small books are interactive objects. They are composed of simple shapes, and lines, but many different materials like wood, string, clear plastic, cardboard, sponge, cloth, buttons, threads and so on. Furthermore, interactive elements are included like cutouts, spirals and flaps evoking multiple sensations and emotions (Ibid.).

Influenced by Piaget's theories, Munari believed that in early childhood children learned and discovered their surroundings with all five senses. They invite multimodal interactions since numerous communications can occur using different means such as verbal, visual, tactile, gestural and so on (Kress and van Leeuwen 2001, 1-2). In her aptly named article "Do Touch" Marni Campanaro quotes Munari about the purpose of the Prelibri book experiment:

The aim of *Prelibri* was to see whether it was possible to use the materials that make-up a book (except the text) as visual language. The question is whether one can communicate visually and tactilely solely by using a book's production materials. In other words, as an object, can a book communicate something beyond the printed word? And if so, what does it communicate? (Munari 1981, 217 and 90).

Significantly, she concludes that through observation and time, children discover the book's details so "test the perceived limits of the book" (Campagnaro 2019, 91). She considers this understanding of limits to be the third of key narrative mechanisms Murari uses in his oeuvre of picture books, often for older children. The first mechanism transforms the book page into a stage of everyday life, and the second considers the book page as an active agent, (with the tangibility to metamorphose) (Ibid., 90). Revolutionarily, Munari intends and enables preliterate children to understand the book form! In all his books Munari enables a reader-viewer-player to become a tactile, mobile investigator.

For his part, Robert Sabuda designs multi-platform books for older children often reworking and adapting classic fairy tales to a new kind of media form. The books are complex opaque objects but his complicated structures include smaller platforms of transparent design such as flaps or peep holes and so on. An interactor performs several roles: as a catalyst, spectator, and has limited agency (Reid-Walsh 2018, 215-218). As a result, engaging with the book is an integrated multimodal experience of reading, viewing, and playing.

Sabuda's adaptations of traditional tales are not restricted to the plot which may be quite close to an earlier version. Significantly he tells a tale by remediating and re-cycling earlier formats and designs of movable books such as peep-holes, accordion folds, and lift the flap and uses them sparingly to achieve certain period effects. Only when an interactor engages with all the movable components is the full narrative revealed. For example, with *Beauty and the Beast* 2010, only full engagement with these devices affords an interactor a full appreciation of the gloomy, gothic atmosphere and the emotional tone of the narrative (Reid-Walsh 2018, 216-20)[12].

David Carter is another inventive and prolific pop-up book engineer. He directs his work to multiple audiences, child and adult, to the extent that many of his experiments often appear to be crossover books. Sometimes he uses abstract themes like *Opposites* (1993), *Colors* (1993) and a series approach like in the counting color books *One red Dot* (2005) and *600 black spots* (2007). His techniques are often ludic so an interactor's engagements are game-play. With different styles and approaches Sabuda and Carter are pushing the genre of pop-up forward. With them paper becomes a "new" medium and their

rolo/libri-animati-e-pop-up/

[12] Due to copyright I am not able to include any images of Robert Sabuda's *Beauty and the Beast*. Please see the Youtube video preview produced by Simon and Schuster 2010 https://www.youtube.com/watch?v=cTQLGyaOAkc For a review of Carter's *White Noise* 2009 see also https://www.publishersweekly.com/978-1-4169-4094-4

JIB.org I, 1 (April 2022)

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elaborate pop-up books a distinct media type.

I end by referring to Carter's recent remediation of one of Munari's famous three-dimensional works - *Le sculture da viaggio di Munari* Corraini (2019).

Carter is very knowledgeable about Munari's work. As Steven Heller observes in his book review of *White Noise* (2009) he refers to Munari's techniques by using papers that made different noises and had different affordances, as Munari did.

Heller says:

> Each spread, designed to make crackly, crinkly, creaky, tinkling or snapping noises as the pages are turned, evokes children's construction-paper cutouts. As sophisticated as the mechanics are, the primary colors and seemingly random tangles of "bits and pieces," as one page describes them, combine in such imperfect forms that they give the illusion that anyone could make this book. My favorite pair of pages, labeled "Sir Anthony's easel and Munari's white noise," is a Miró-esque three-dimensional painting. The Munari reference, incidentally, is to Bruno Munari, the Italian Futurist and pioneer of interactive children's books. (I don't know who Sir Anthony is, but I'm sure he's worthy.) (Heller 2009) [13]

Here with *Le sculture da viaggio* Carter remediates Munari's travelling sculptures to a pop-up book format. In so doing he educates a viewer about how Munari's sculptures started as small, pocket size objects to be carried by a traveler when away from home. In Carter's pop-up book when an interactor opens the double-page spread, the sculptures assume a slanting angle–This creates an effect of the miniature sculptures' agency since they seem ready to walk off the page towards us!

By their inventiveness, Munari, Sabuda and David Carter sometimes seem to create even a reverse "Eliza effect" with artifacts that appear simple but are the reverse—the inside appearing as the outside for example. Creating complex contradictions, in individual ways, and for different audiences, all of these artists are playing games with their interactors. By so doing they are testing the limits of what a contemporary interactive book can be.

At the same time, these contemporary interactive books have direct connections with the earlier books discussed throughout this essay. No matter their design effects (transparent, opaque or a combination of effects so they appear complex and simple) their power lies "in their ability to surprise" based on the "ingenuity" of how the "bookish format conceals unbookish characteristics" (Opie and Opie 1975, 1055). Or to reframe the Opies' prescient remark, what all the examples of interactive books from the 18th to 21st century have in common is an ability to refashion the relationships between book and reader-viewer-player or interactor in multiple, playful ways. A final puzzle remains from the Opies' title: "Books that Come to Life." Do the book pages only appear to or do they possess their own agency?

[13] For Carter's remediation of Munari's sculptures see https://corraini.com/en/le-sculture-da-viaggio-di-munari.html.

JIB.org I, 1 (April 2022)

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