BDIB: the first Bibliographic Database of Interactive Books

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This paper presents the project Bibliographic Database of Interactive Books (BDIB), which seeks to reconstruct the landscape of European animated book production from the thirteenth to the twentieth century. The project is conceived as a large-scale bibliographical enterprise aimed at advancing knowledge of these artefacts and fostering their study by investigating their production techniques, economic dimension, socio-cultural readership, and modes of use.
Rather than functioning as a traditional catalogue, BDIB operates as an aggregator of bibliographic data drawn from a wide range of heterogeneous international sources, both primary and secondary, including library catalogues, private collections, booksellers' catalogues, publishers' lists, and auction records.
The BDIB portal forms part of the Share Family ecosystem, an international collaborative initiative that employs Linked Open Data (LOD) technologies to convert library catalogue records into LOD according to the BIBFRAME model. By integrating bibliographical research with digital infrastructures, the project aims to provide a new research tool for the study of interactive books and their circulation within the history of the book.

Interactive books

The expression "animated or interactive books" is an umbrella term that refers to a wide variety of book types and paper-based mechanisms. While they share certain characteristics and functions, including the ability to transcend the limits of textuality in the traditional sense and to enable different, but not mutually exclusive, modes of use (reading, viewing, manipulation), they are not interchangeable. Technically, these are books designed for very different purposes, ranging from educational to memory-enhancing, recreational and divinatory, which incorporate mobile, mechanical or paratextual devices that require and encourage reader

* The content and structure of this paper are the result of the intellectual collaboration of all four authors, who, however, are responsible for drafting the individual paragraphs: Michela Giacomelli, *Interactive Books* and *A Threshold of Knowledge*; Annalisa Di Sabato, *The Portal*; *The Bibliographic Database*; *The Cluster or Entity Knowledge Base*; *The web interface* (together with Alice Guercio). Gianfranco Crupi, the project's creator, coordinated and standardized the editorial drafting of the text.

interaction. This interactivity is achieved mainly through the movement of one or more elements of the paper medium, giving the book two-dimensional, three-dimensional, kinetic, fading and other visual effects. Books in motion therefore involve unusual ways of handling them: from unusual and eccentric openings to the use of flaps, volvelles, pull-tabs and fade-outs that "augment" the pages in terms of layers, dimensions, directions and combinations[1].

Volvelles and flaps were the two most common devices used in scientific books between the sixteenth and seventeenth centuries.
Volvelles, or rotating discs, were made of parchment or paper, fixed and superimposed on the page below with one or more pins, which allowed each disc to rotate freely and independently around its own axis. Widely used in a variety of applications and uses – from cryptography to rhetoric, from astronomy to astrology – these instruments were used for complex mathematical, calendrical and astronomical calculations, as well as for random processes, such as in the tradition of divination texts (Fig. 1).

Figure 1. *Volvella: P. Apianus, Cosmographicus liber, Anversa, Ioan. Grapheus typis cudebat Antuerpiae, 1533 (Biblioteca Universitaria Alessandrina)*

[1] On the history of "animated books", as well as the now classic article by Sten Gabriel Lindberg, *Mobiles in Books. Volvelles, Inserts, Pyramids, Divinations, and Children's Games*, «The Private Library: quarterly journal of the private libraries association», 2 (1979), p. 49-82 and Pietro Franchi's pioneering study, *Apriti libro! Meccanismi, figure, tridimensionalità in libri animati dal XVI al XX secolo*, Ravenna: Essegi, 1998. See the monographs by Suzanne Karr Schmidt, *Interactive and Sculptural Printmaking in the Renaissance*, Leiden-Boston: Brill, 2018 and by Jacqueline Reid-Walsh, *Interactive Books. Playful Media Before Pop-Ups*, New York and London: Routledge, 2018. See also the miscellaneous volumes *Pop-App. Scienza, arte e gioco nella storia dei libri animati dalla carta alle app*, edited by G. Crupi and P. Vagliani, Turin: Fondazione Tancredi di Barolo, 2019; *Libri animati fra studio, ricerca, tecnica e creazione*, edited by G. Crupi, Milano: Ledizioni, 2024.

As mentioned, a flap is a piece of paper or parchment designed to cover and then reveal portions of text or images underneath. Their most significant use between the sixteenth and nineteenth centuries was in anatomical treatises, known as *anatomical flap books*, in which the progressive lifting of individual flaps allowed the internal structure and layered arrangement of the organs and systems of the human body to be explored (Fig. 2).

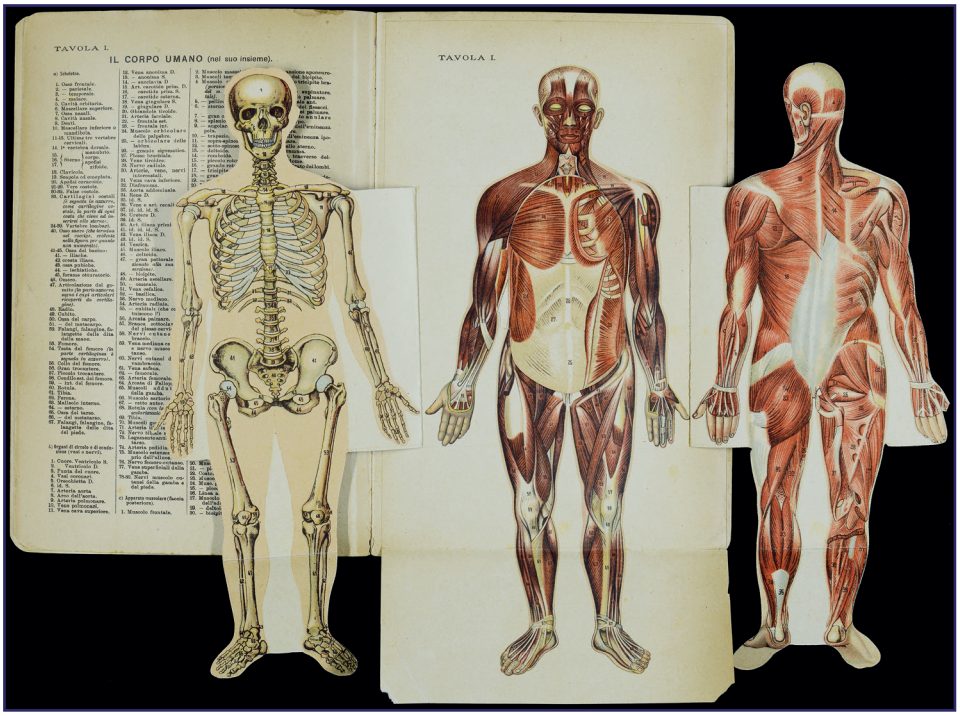

Figure 2. *Flap: Atlante elementare di anatomia, Turin: S. Lattes & C. editori, [19...?]*
(Biblioteca di Biologia e biotecnologie Charles Darwin – Sapienza University of Rome)

Between the end of the eighteenth century and the beginning of the nineteenth century, far-reaching changes in the historical, economic and cultural context made way for a new kind of publishing enterprise. Animated books, then mainly aimed at children or technical knowledge, began to make use of an increasingly wide and ingenious range of devices and paper-based techniques. However, the history of the manipulation of paper and parchment, used as materials not exclusively for writing, is actually long and complex.

If we go back in time and move to a different geographical context, we can think of Japanese *origami*, heir to the ancient tradition of *orikata*[2], or papal *flabella* – ceremonial fans also made with pleated parchment[3] – or even the "astrological square", compiled on a sheet of paper divided and folded[4], whose multiform square composition was adopted in some areas of France, southern Germany and pre-Reformation Austria for the drafting of baptismal certificates. However, it was only in the Middle Ages that the history of paper production in the West intersected with that of books – first manuscripts, then printed works – starting with the original documentary evidence found in the *Chronica Majora* and the *Book of Fate* by the Benedictine monk Matthew Paris (c. 1200–1259)[5] and the *Ars Magna* by the Catalan-speaking Majorcan philosopher Raymon Llull (1232/33–1315)[6]. The popularity of volvelles and their functional versatility was consolidated with the revolution in movable type printing, which allowed their use to be extended to a wider audience, enabling them to exploit their interactive potential. The combination of paper technology, rotary motion and combinatorial methods greatly expanded their field of application, reaching areas of scientific knowledge that mathematised aspects of understanding nature (such as medical astrology) and integrating with astronomical tradition, which used volvelle to measure the latitude of a point on the Earth's surface and estimate the position of the stars[7].

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[2] Although the word origami is Japanese in origin, modern origami practices—particularly in the context of early childhood education in Meiji Japan—were partly reshaped by the reception of Friedrich Fröbel's kindergarten pedagogy. Within this pedagogical framework, Papier-Falten ("paper-folding") constituted one of Fröbel's "Occupations" and contributed to the transformation of paper-folding into an educational practice in Japan from the 1870s onward. See: Yukiyo Nishida, *Something Old, Something New, Something Borrowed, and Something Froebel? The Development of Origami in Early Childhood Education in Japan*, «Paedagogica Historica», 55 (2019), 4, p. 529–547.

[3] In the sixteenth century, pleating, this time of fabric, was widely used to decorate tables laid with elaborate creations of pleated and folded napkins.

[4] The "astrological square" was used from the Middle Ages onwards to create horoscopes for people, places and events.

[5] On Matthew Paris, see in particular the studies by Richard Vaughan, *Matthew Paris*, Cambridge, Cambridge University Press: 1958; Suzanne Lewis, *The Art of Matthew Paris in the Chronica Majora,* Aldershot: Scolar Press, 1987; Daniel K. Connolly, *The Maps of Matthew Paris. Medieval Journeys through Space, Time and Liturgy*, Woodbridge: The Boydell Press, 2009.

[6] On the complex intellectual figure of Llull, see the important studies by: Robert D.F. Pring-Mill, *Il microcosmo lulliano*, trad. it. di S. Muzzi, Roma: Antonianum, 2007 (original edition, 1961); Erhard Wolfram Platzeck, *Raimund Lull*: *sein Leben, seine Werke, die Grundlagen seines Denkens (Prinzipienlehre),* Dusseldorf: Schwann, 1962-1964, 2v.; Paolo Rossi, *Clavis Universalis. Arti mnemoniche e logica combinatoria da Lullo a Leibniz*, Bologna: il Mulino, 1983; Anthony Bonner, *The Art and Logic of Ramon Llull. A User's Guide*, Leiden: Brill, 2007; Umberto Eco, *Dall'albero al labirinto. Studi storici sul segno e l'interpretazione*, Milan: Bompiani, 2007; Alexander Fidora, Josep E. Rubio, *Raimundus Lullus. An introduction to his Life, Works and Thought*, Turnhout: Brepols, 2008.

[7] For the *volvella* understood as a movable device and paper instrument, see Gianfranco Crupi, *Volvelles of Knowledge. Origin and Development of an Instrument of Scientific Imagination*, «JLIS.it», 10 (2019), n. 2, p. 1–27; Boris Jardine, *The Book as Instrument: Craft and Technique in Early Mod-*

Indeed, for more than a century, volvelles became a popular and indispensable companion to treatises on the art of navigation and astronomy manuals, an educational aid that conveyed technical information in an interactive and accessible format. Emblematic evidence of this is the successful tradition of printing astronomy treatises in the sixteenth and seventeenth centuries, pioneered by *Kalendario* (1476)[8] by the German mathematician Johann Müller (1436–1476), better known by his humanistic name Regiomontanus[9], and carried on by, among others, the mathematician and cosmographer Petrus Apianus (1495-1552), who in 1524 published the *Cosmographicus liber*[10] – an important work in the field of astronomical, geographical and cartographic studies of the sixteenth century, in which the author put the concepts of Ptolemaic astronomical culture to good use.

The other movable device, whose functional potential has already been mentioned, consists of flaps. The first to offer an impression of depth and three-dimensionality, these movable elements were, as mentioned, widely used in books on anatomy, providing evidence of scientific interest and progress made in anatomical and physiological studies of the human body, starting with the unprecedented perspective introduced by the Flemish anatomist Andreas Vesalius (1514–1564). He is credited with surpassing the centuries-old medical tradition founded on Galen's theories in favour of a method based on direct observation of the body. His work, *De humani corporis fabrica* (published in Basel in 1543) and, in particular, its related *Epitome*[11], became an enduring publishing model, thanks in part to the introduction of flaps, which have since become established as an educational supplement to medical texts. By progressively lifting these movable elements, the reader/viewer was, in fact, invited to participate in a virtual post-mortem examination that simulated the process of human dissection practised in anatomical theatres.

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ern Practical Mathematics, «The British Journal for the History of Science. BJHS Themes», 5 (2020), p. 111–129. For the most recent systematic study of astronomical *volvelles* in the commentary tradition of Sacrobosco's De sphaera, see Alica-Nana Citron, *Spinning the Cosmos: Volvelles in the Early Modern Commentary Tradition of Johannes de Sacrobosco's De Sphaera*, Cham: Springer Nature Switzerland, 2025.

8 Iohannes Regiomontanus, *Questa opra da ogni parte e un libro doro. Non fu piu preciosa gemma mai dil kalendario: che tratta cose asai con gran facilita*, Venetijs: Bernardus pictor de Augusta, Petrus Loslein de Langencen, Erhardus ratdolt de Augusta, 1476.

9 His treatise is a landmark in the history of typography because it features the first Italian title page and is also the first printed work to include some movable devices for calculating time, predicting solar and lunar eclipses from 1475 to 1530, and predicting the days of the year on which certain movable holidays, such as Easter, would fall.

10 Petrus Apianus, *Cosmographicus liber Petri Apiani mathematici* [...], Anversa: Ioan. Grapheus typis cudebat Antuerpiae, 1533.

11 Andreas Vesalius, *Andreae Vesalii Bruxellensis De humani corporis fabrica libri septem*, Basileae: ex officina Ioannis Oporini, 1543.

A sampling of interactive books from the early modern period reveals that they were not only a medium for transmitting knowledge but also a tool for direct experimentation with knowledge, a physical space for self-learning. Of particular note is the fact that some of these books included paratextual elements that consisted not only of images of the instruments and objects depicted, but also explanatory texts illustrating their operation and assembly, thereby transforming the book itself into a mobile device similar to those contained and described within it.

The catalogue of movable books certainly does not end with the medieval and early modern examples mentioned above. Over time, both the mechanisms and the target audience for interactive books have changed. Unlike their older counterparts, animated children's books from the eighteenth century onwards offered a much wider range of devices and paper-based techniques. Books that sprang to life physically, through levers, discs and pull-strings (*panorama pictures, mechanical pictures, revolving pictures*), books that became something else when opened (*carousel books, theatre books, peep shows or tunnel books*), or that unfolded into surprising three-dimensional effects, as in the hugely successful era of *pop-up books*. Creations that, thanks to the ingenious creativity of paper engineers – including Germans Ernest Nister (1842–1909), Raphael Tuck (1821–1900) and Lothar Meggendorfer (1847–1925) – developed in interaction with the world of illustrated books and that of toys and paper games, drawing on the wonderful and surprising ideas that playful materials, originating from theatre and pre-cinema culture, would gradually make available to the world of childhood.

A threshold of knowledge

Nevertheless, the study and public awareness of these extraordinary book artefacts are undermined and limited by their rare nature, the intrinsic fragility and delicacy of their supports and materials, and their dispersion among private collections.

They have also not been given any special treatment in terms of cataloguing, making them difficult to identify within library archives and collections.

The *Bibliographic Database of Interactive Books (BDIB)* project was launched with the aim of reconstructing the map of European interactive book production between the thirteenth and twentieth centuries: a bibliographic undertaking that ultimately aims to broaden knowledge of these books and support their study by investigating their production characteristics, economic dimension, the socio-cultural composition of their target audience, and how they were used. Movable books, whether ancient or modern, are objects of particular interest to historians (and not only those specialising in books): from a bibliological point of view, due to the coexistence of

heterogeneous materials and the different methods of composition and assembly of the devices; from a bibliographic point of view, due to the not yet standardised practices of their cataloguing description[12]; from the point of view of conservation procedures and restoration techniques, for which there are no established guidelines[13]; from a linguistic point of view, due to the lack of a uniform conventional glossary; from the point of view of the history of science and art, due to the combination of iconographic traditions and scientific knowledge in the representation and creation of a complex, multimedia, multifaceted and changing instrumental culture.

The *Bibliographic Database of Interactive Books* therefore consists of bibliographic information on cards and books, manuscripts and printed works, both ancient and modern, containing interactive paper devices. It is not intended to serve as a catalogue, but rather as a collection of records from multiple and diverse international sources, both primary and secondary (library catalogues, private collections, sales catalogues, publications, auctions, etc.). Its structure is designed to simplify data entry and retrieval, both via the usual access points and by browsing through interactive features and paper-based inventions.

The portal

The BDIB portal[14] is part of the Share Family ecosystem[15], an international collaborative venture that uses Linked Open Data technologies to transform library catalogue data into LOD according to the BIBFRAME model[16]. Share Family is therefore a global community that connects the GLAM (Galleries, Libraries, Archives and Museums) world, combining expertise and resources within a constantly expanding network of interconnected data.

As mentioned, the technological heart of the Share Family ecosystem consists of the LOD infrastructure that produces, enriches, preserves and publishes bibliographic and cultural data, which is converted, according to

[12] To date, the most comprehensive study is that by Anthony S. Drennan, *The Bibliographical Description of Astronomical Volvelles and Other Moveable Diagrams*, «The Library», 13 (2012), n. 3, p. 316–339, <https://doi.org/10.1093/library/13.3.316>.

[13] This addresses some aspects of the preservation of these ephemeral materials. Laurel Braswell-Means, *The Vulnerability at Volvelles in Manuscript Codices*, «Manuscripta», 35 (1991), p. 43–54.

[14] Bibliographic Database of Interactive Books, <https://bdib.share-family.org> (beta version of the portal).

[15] Cfr. *Share Family Linked Data Ecosystem*, <https://wiki.share-vde.org/wiki/ShareFamily:Main_Page>.

[16] BIBFRAME (Bibliographic Framework) is a data model based on Linked Data and RDF, developed by the Library of Congress to replace the MARC format and adapt bibliographic descriptions to the web. Organises information into three levels (Work, Instance, Item) to make data more interoperable, identifiable and useful both within and outside the library community.

the principles of Linked Open Data[17], into RDF, using ontological models that represent different domains of knowledge, including BIBFRAME, IFLA LRM[18], RiC-O[19], ArCo[20], etc.

The Share Family initiative includes several "hubs" or tenants consisting of collaborative environments, defined on the basis of a specific domain: Share-VDE[21] (Share Virtual Discovery Environment), the collective catalogue of major North American and European academic and national libraries; Share-Catalogue[22], the Italian network of university libraries in southern Italy; Parsifal[23], the portal of the URBE consortium (Unione Romana Biblioteche Ecclesiastiche, Roman Union of Ecclesiastical Libraries); LILLIT[24], the portal of Italian illustrated books 1501–1800.

The specific characteristics of each environment or "hub" constitute a significant resource, capable of generating value not only for the entire Share Family, but also for the individual disciplinary communities involved. Dedicated LOD environments expand the potential for discovering bibliographic resources and reveal connections and information that would otherwise remain hidden in traditional archives. This allows participating institutions to manage large amounts of data, promoting sharing, interoperability, reuse and growth of the common information heritage.

The BDIB centre also operates within this context, aiming – as mentioned above – to fill a significant gap in the census, description and study of interactive books. Through the definition of a specific and interoperable metadata model, the physical, mechanical and narrative characteristics of books and prints with movable components are represented, highlighting their historical and cultural significance.

The creation of the BDIB portal was carried out in a series of preliminary stages, which involved:

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[17] Standard W3C model used to represent and exchange information on the web in a semantic and structured form, transforming it into a network of relationships, where each element is linked semantically to another.

[18] *IFLA Library Reference Model. A conceptual model for bibliographic information*, <https://www.ifla.org/wp-content/uploads/2019/05/assets/cataloguing/frbr-lrm/ifla-lrm-august-2017_rev201712-it.pdf>.

[19] RiC-O (Records in Contexts-Ontology) is an OWL 2 ontology that formalises the Records in Contexts conceptual model (RiC-CM) of the International Council on Archives (ICA) <https://www.ica.org/resource/records-in-contexts-ontology/>.

[20] *ArCo Project - Architecture of Knowledge*, <https://iccd.cultura.gov.it/it/percondividere/ProgettoArCo>.

[21] Anna Lionetti, *Share Family and Share-VDE: linked data for libraries*, <https://wiki.share-vde.org/wiki/Main_Page>.

[22] Share Catalogue, <https://catalogo.share-cat.unina.it/sharecat/clusters>.

[23] URBE Parsifal Catalogue, <https://parsifal.urbe.it/parsifal/>.

[24] "LILLIT: Illustrated Italian books, 1501–1800", <https://lillit.share-family.org/lillit/>. Lillit was developed as part of a research project led by Maria Teresa Biagetti of Sapienza University of Rome, involving collaboration with the ICCU (The Central Institute for the Union Catalogue of Italian Libraries) and the ICG (Central Institute for Graphics).

– the creation of a bibliographic database structured according to cataloguing standards;
– the creation of the Cluster Knowledge Base (CKB) or Entity Knowledge Base (EKB) for structuring data into entities;
– the development (currently underway) of the portal's web interface for the publication of data and its navigation.

The Bibliographic Database

For consistency and quality in the description of resources, appropriately selected examples of interactive books have been catalogued according to ISBD and REICAT cataloguing standards, using the OLISuite WeCat cataloguing module[25], which structures records in MARC 21 format, saved in a relational database.
However, to compensate for the lack of specific fields (tags) in MARC formats suitable for accommodating and describing the interactive and paper-based elements of this type of bibliographic resource, some local tags in the WeCat cataloguing module have been customised according to specific descriptors indicated by the research group led and coordinated by Gianfranco Crupi[26].
In particular, tag 099 was used for the source of the description; 590 to provide information on the type of movable device (e.g. flap, volvella, etc.); 591 for the bibliographic type (pop-up book, scenic book, etc.); 592 for the type of illustrations (vignettes, frontispieces, etc.); 593 for engraving techniques (intaglio, burin, etc.).
The customisation of specific local tags has made it possible to exploit a function of the WeCat application, which displays a series of controlled values for each tag, in order to avoid typing errors or the use of semantically similar descriptors and, consequently, to allow the creation of specific search facets in the BDIB portal, such as: "movable device", "bibliographic type", "engraving technique", "source of description", "century" and "owner" (Fig. 3).
All of the descriptors are still being defined, however, as the project aims to align itself with the findings of the working group set up at the ICCU, which is dedicated to the cataloguing aspects of interactive books. The Group's main objective is to provide the library and research community with a standardised descriptive model and unambiguous semantics for the different devices used and the various bibliographic types.

[25] OLISuite is a new generation Integrated Library System (ILS) developed by @Cult, a partner to Casalini Libri, designed for the complete management of bibliographic flow (acquisition, cataloguing, lending) and oriented towards Linked Open Data and RDA standards. It includes specific modules such as WeCat dedicated to cataloguing.
[26] The working group consists of Michela Giacomelli, Daria Moretti, Laura Riccioluti and Valentina Sestini.

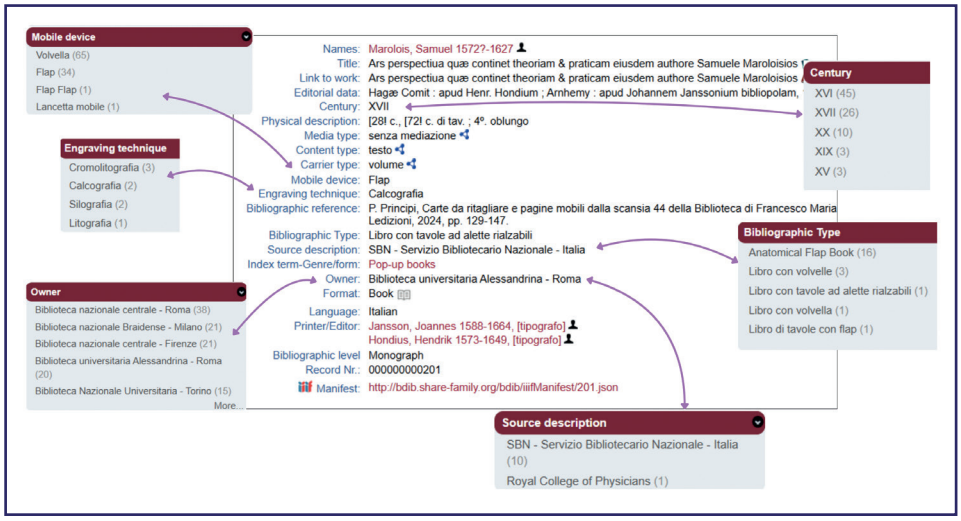

Figure 3. *Search facets of the BDIB portal, also displayed in the catalogue description of the resource*

The Cluster or Entity Knowledge Base

After creating the bibliographic database, the next step was data ingestion: the data is exported to MARC 21 to be processed and analysed by a module (Entity Resolution), which recognises and clusters different entities, such as authors, works and publications, according to the model defined by the SVDE ontology[27]. The clustering module uses text analysis techniques to compare strings and link information, even when they appear with different names or forms. To further improve identification, the Authify framework is used[28], a service that allows data to be compared with authoritative external sources, such as VIAF, ISNI, Library of Congress Name Authority File, etc. During this phase, the data is supplemented with additional information from these sources, including name variants and URIs that identify the same entities in other systems. This process of data reconciliation and data enrichment is an important step because it allows, in the next phase of publication in Linked Open Data, the creation of connections with other datasets (interlinking) and promotes the sharing and reuse of information on the web.

The result of this work is the BDIB project's Cluster Knowledge Base (CKB), a database that collects all identified and interconnected entities. The CKB can

[27] The SVDE ontology is an extension of BIBFRAME, modelled within the Share Family initiative. Although the ontology supports the discovery capabilities of Share Family search systems, it can be reused in any system that requires a link between BIBFRAME, IFLA LRM, and RDA. The preliminary version of the SVDE ontology has been published and can be consulted at <https://doi.org/10.5281/zenodo.8332350>.

[28] On Authify, see Anna Lionetti, *LOD Platform workflow components*, <https://wiki.share-vde.org/wiki/ShareDoc:PublicDocumentation/LODPlatform/Workflow#Authify>.

be consulted via queries (SPARQL) or APIs, and its data is converted into RDF format using the Lodify tool[29], following the model defined by the SVDE ontology.

The Web Interface

The final phase of the project, which is nearing completion, was dedicated to publishing bibliographic data on the BDIB portal. In it, the Linked Open Data research approach is combined with the traditional OPAC approach, transforming the information contained in bibliographic records into open, linked and interoperable data.

The portal offers two different paths for exploration and research. The first allows users to find information relating to entities of the Agent type (Fig. 4), identified on the portal with the most common label "Name" (people, organisations and families) and of the Publication type (titles of well-known works or specific editions). Each entity has a unique identifier and a dedicated page displaying links to authoritative external sources (VIAF, ISNI, Wikipedia, etc.) along with relationships to other entities such as Works and Publications.

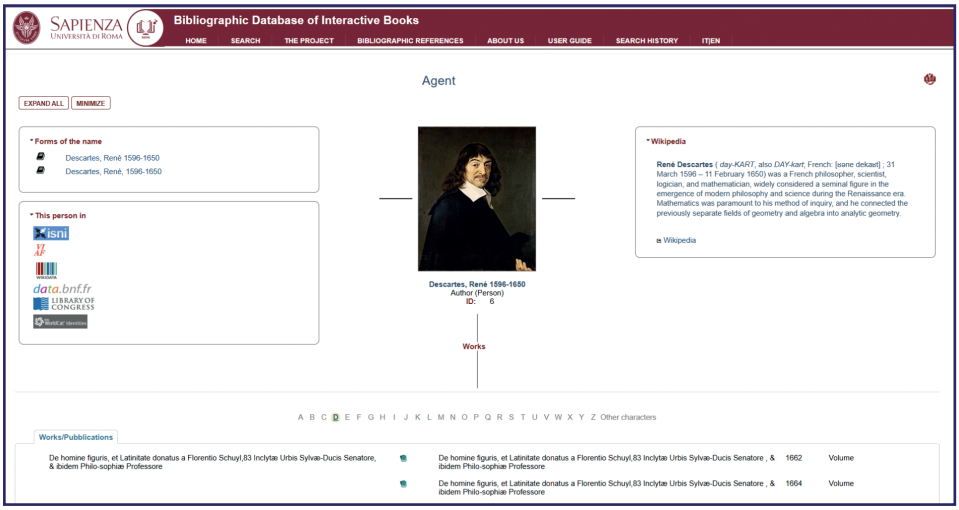

Figure 4. *Agent-type entity*

The second search path is the one most familiar to users, typical of traditional OPACs, enriched with indexes and search facets developed on the basis of local MARC tags, customised for the project and used in the first phase of bibliographic description of the resource. These tools make navigation more intuitive and facilitate the identification of bibliographic resources of interest. Another strength of the portal is its integration with the International Image

[29] Lodify is the tool for converting and publishing data in RDF format using the LOD Platform 1.0, according to the BIBFRAME 2.0 ontology.

Interoperability Framework (IIIF) protocol[30], the international standard that allows high-definition images, audio and video to be shared and explored on the web.
The main component of IIIF is the *manifest* (in JSON format)[31], a file that describes a digital object so that it can be easily viewed and used on different platforms that support the IIIF standard.
An IIIF manifest contains:
– metadata, i.e. information about the resource (title, author, description, etc.);
– links to high-resolution images or pages of the item;
– information about the sequence and logical structure of digital objects, necessary for their presentation – such as the order in which pages or parts should appear (useful, for example, for a digital book);
– links to additional resources, such as transcripts, translations, or annotations.

Thanks to the IIIF standard, the portal allows users to request only the portion or resolution of the image they need and to link images and metadata, also enabling text searches within the images themselves.
High-definition digital images are saved in a dedicated repository and managed by the Cantaloupe server[32], providing the requested images dynamically when the user opens the resource on the portal. Using the information provided by the manifest, the Mirador viewer then reconstructs the structure of the document on screen, allowing the user to navigate, zoom in and interact with the digital pages.
The images can consist of either standard reproductions of the pages or multiple versions of the same page, corresponding to different visual states (layers), generated, for example, by sequentially lifting the flaps. (Fig. 5)
Through multi-level management of the digital page, it is therefore possible to reproduce on screen the dynamics of overlapping, opening and highlighting graphic and textual elements. This approach allows users to enjoy an experience that is as similar as possible to physically "leafing through" a book, giving them the feeling of having the volume right at their fingertips. At the same time, it makes a portion of the bibliographic universe available that, under ordinary circumstances, would remain inaccessible: works of

[30] International Image Interoperability Framework, <https://iiif.io/>.
[31] JSON, <https://www.json.org/json-en.html>.
[32] "Cantaloupe" is an open-source dynamic image server written in Java, designed to generate resized, cropped, and rotated versions of high-resolution images on the fly. It is often used in digital library and archive contexts. See: *Cantaloupe High-performance dynamic image server in Java*, <https://cantaloupe-project.github.io/>.

high intrinsic value, often rare or valuable, preserved in private collections and therefore difficult for the public to consult.
The creation of the BDIB portal, the publication of data in Linked Open Data format and the integration of the IIIF protocol for viewing and exploring interactive books are concrete steps towards free and inclusive access to knowledge and information, encouraging the availability of open bibliographic resources and helping to eliminate technological and economic barriers. The gap between closed collections and users is bridged by the use of resources through the portal, which guarantees full accessibility.

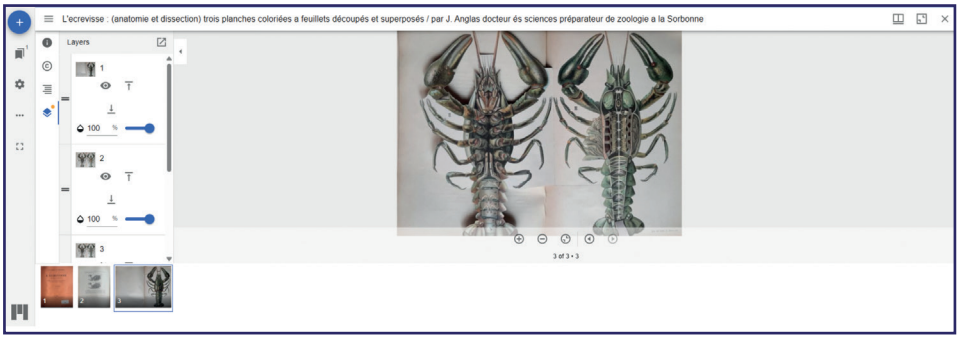

Figure 5. *Image displayed by the BDIB portal; taken from Julus Philippe Anglas, L'ecrevisse: anatomie et dissection. Trois planches coloriées a feuillets découpés et superposés, Paris: Schleicher frères et C.ie, [19..].*

In keeping with this principle, the separation between resource storage, image delivery services and presentation levels promotes system scalability, content reuse and the technological independence of individual components. In the long term, this architecture guarantees high levels of interoperability, which allows the same resource to be reused and integrated in different environments and systems, while also ensuring greater overall sustainability without the need to rebuild the entire technological infrastructure.
The outcome is a portal that not only preserves bibliographic memory, but transforms it into a living heritage, enabling dialogue with the network, evolving over time and offering an immersive consultation process consistent with the original book.

Il contributo intende illustrare il progetto Bibliographic Database of Interactive Books (BDIB), che si propone di ricostruire il panorama della produzione europea dei libri interattivi dal XIII al XX secolo. Il progetto è concepito come un'impresa bibliografica su larga scala volta ad accrescere la conoscenza di questi artefatti e a promuoverne lo studio attraverso l'analisi delle loro tecniche di produzione, della dimensione economica, della composizione socio-culturale dei lettori e delle loro modalità di fruizione.
Piuttosto che configurarsi come un catalogo tradizionale, BDIB opera come un aggregatore di dati bibliografici provenienti da un'ampia gamma di fonti internazionali eterogenee, sia primarie che secondarie, tra cui cataloghi di biblioteche, collezioni private, cataloghi di vendita, editoriali, d'asta ecc. Il portale BDIB fa parte dell'ecosistema Share Family, un'iniziativa collaborativa internazionale che utilizza tecnologie Linked Open Data (LOD) per convertire i dati dei cataloghi bibliotecari in LOD secondo il modello BIBFRAME. Integrando la ricerca bibliografica con infrastrutture digitali, il progetto mira a offrire un nuovo strumento di ricerca per lo studio dei libri interattivi e della loro circolazione nell'ambito della storia del libro.

L'ultima consultazione dei siti web è avvenuta nel mese di giugno 2026