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Science and comics: from popularization to the discipline of Comics Studies

Abstract. *Modern scientific communication traditionally uses visual narratives, such as comics, for education, presentation of scientific achievements to a mass audience, and as an object of research. The article offers a three-level characterization of the interaction of comic culture and science in a diachronic aspect. Attention is focused not only on the chronological stages of these intersections, the expression of the specifics of the interaction is offered against the background of scientific and public discussions that accompany the comics–science dialogue to this day. Within the framework of the first stage (the appearance and distribution of popular science and educational comics), the characteristics of comics content necessary for the different genesis are highlighted: documentary storytelling, educational practices of learning through drawing, active cooperation with well-known companies and institutions, informativeness and empathic involvement of the young reader in a heroico-romantic narrative of scientific discoveries and mastering nature. With the intensification of interdisciplinary approaches (the second stage), comics are increasingly involved in presenting scientific results within the most diverse fields. Comics-based research is becoming an interdisciplinary method and a widespread practical area with the corresponding formation of scientific tools (applied comics, data comics), forms of interdisciplinary interaction (graphic medicine, ethnography, narrative geography, urban comics, comics journalism, etc.), and scientific publications (“The Comics Grid: Journal of Comics Scholarship”, “Sequentials”). The national format of comics-based research is presented on the example of Ukrainian comics projects (historical, feminist comics). In the genesis of development, Comics Studies have gone from a field of research to disciplinary definitions. In the creation of the metadiscourse of the*



scientific direction (the third stage), the authors focused on scientific discussions, the formation of academic directions and approaches, and markers of disciplinary self-identification. Emphasis is placed on the unique phenomenon of the simultaneous concordance of various stages of the dialogue between comics and science, on the prolonged replication of successful inventions into modern experience, and the active testing of known narratives at new levels of a scientific presentation.

Keywords: *scientific communication; applied comics; comics-based research; comics studies*

Introduction.

The interaction between the art of sequential images and science has a long history in developing illustrative techniques and auxiliary means of presenting the material. With the spread of scientific comics in the middle of the 20th century, their introduction into educational practices, and popular science discourse, the graphic narrative lost its stigmatized status, combining entertainment and motivation for learning as an accessible mass form of scientific communication (Tatalovic, 2009).

Modern scientific communication increasingly uses visual techniques for popularizing knowledge and scientific discoveries (Dunst, Laubrock, & Wildfeuer, 2018; Jonsson & Grafström, 2021; Peterle, 2021; Forde, 2022). Lists of comics suitable for use in the natural sciences, social sciences, and humanities are included in university curricula and syllabi (see, for example, <http://comicbooksyllabus.com>). The relevance and demand of such techniques are illustrated by new requests from the audience, especially the young. The familiar and traditional form of knowledge popularization in the science–comics dialogue acquired unique qualities. Today, the use of comics as a tool for visualizing scientific results has rooted in the practice of using graphic narratives in archeology (Kamash, Soar, & Van Broeck, 2022), biology (Hosler & Boomer, 2011), art history (Thornborrow & Gosse, 2020; Chang, 2021), architecture and urban planning (Cancellieri & Peterle, 2021), pedagogy (LeBlanc & Irwin, 2018; Alie, Ilhamdi, & Saputra, 2021), journalism (Weber & Rall, 2017; Hudoshnyk, 2020), in mathematics (Puput, Ahmadi, & Rochmad, 2021), computer sciences (Augereau, Iwata, & Kise, 2018) and interdisciplinary methods (Farinella, 2018; McNicol, 2019; Jacobs, 2019; Kuttner, Weaver-Hightower, & Sousanis, 2020).

In turn, the study of comics from an interdisciplinary space in the last decade reaches the level of forming a new subject field – Comics Studies, with appropriate academic markers and standards (scientific publications, dictionaries, monographs, international conferences, dissertations, and university courses and doctoral programs). The history of the formation of certain areas of science and art is colorful, changeable and, most importantly, extended over time. It is all the more relevant for a researcher to see the birth of a new field, the transition from quantitative research to the formation of qualitative definitions of a new discipline. Comics studies build concepts of self-determination and the history of its formation in complex discussions (Domsch, Hassler-Forest, & Vanderbeke, 2018; Aldama, 2020; Hatfield & Beaty, 2020; Fawaz, Whaley, & Streeby, 2021; Cour, Grennan, Spanjers, & Nature, 2022).

We identified three stages in the interaction of science and comics. We note right away that in chronological space they do not successively replace one another: the communication feature of consists in the active use of the newest and already invented forms, in the almost unique concordance of creative discoveries and their scientific research, in the active participation of the audience as a powerful actor in the development and comic culture, and its study. As a result, comic artists become the first comic researchers and popularizers, and the scientific space of the industry is actively open to author explorations and the comic fan community.

The first stage (1941 – until today) of the use of comics as an illustrative and didactic form of demonstration of scientific results (popular science, educational, educational comics).

The second stage (the 1970s – until today) – is an interdisciplinary research and the latest practices of comics-based research, the spread of applied comics.

The third stage (2010 – until today) is the formation and self-identification of the scientific field of graphic narrative research (Comics Studies).

Therefore, the *purpose* of this article is to review the history of the intersection of science and comics, including in the Ukrainian scientific space, in the areas of the popularization of science, the spread of comics-based research as a continuation of the interdisciplinary approach in comics criticism; formation of a new discipline of Comics Studies. To illustrate these stages, we choose series, comic books, and cycles that contain important ones characteristics for further genesis. Due to the powerful discussion context of the stated topic, we consider it appropriate to at least outline the subjects of these academic, pedagogical, and public discussions.

Stage I. Education, popular science and comics.

The active spread of popular science series, for example in the USA, coincided with the beginning of the Second World War and was determined by the urgent need to create a heroic narrative in which real people, not mythological ones, win.

Documentary, mastered by graphic storytelling, became extremely popular and in demand, and the need to create accessible educational content for a certain time removed a rather tough discussion in society about the quality of the comic genre. Series “True Comics” (1941–1950), “Real Heroes” (1941–1946), “Real Life Comics” (1941–1952) rivaled readers in terms of audience popular superhero comics and set a goal in difficult wartime to provide examples of exceptional courage not only at the front but also in all spheres of life. A modified Byronic quote about truth being stranger than fiction became the epigraph of “True Comics”: *TRUTH is strange and a thousand times more thrilling than FICTION*. It was the first edition devoted to real heroes of history, science, politics, military affairs, medicine, sports, etc. The Editorial Board monitored the selection of personalities and topics, and historians, educators, and sociologists worked as consultants on the issues of the series. This meticulous attention to educational comics was related to the public debate in American society about the advisability of introducing children to comics (S. North A National Disgrace. *Chicago Daily News*. May 28, 1940), so to some extent, popular science became the ‘savior’ of the comic industry. And the documentary of the first popular series was later extended

by the powerful direction of documentary comics with the appropriate typology (military, social, environmental, reportage) and research methodology (Chute, 2016; Mickwitz, 2016; Schmid, 2021).

The active development of educational, popular science, and educational comics did not cancel the confrontation between high and low literature (comics included), which only intensified after the war. In 1954, Fredric Wertham's book "Seduction of the Innocent" was published, which argued that comic books contribute to juvenile delinquency. A lively debate in the press and communities, at parent-teacher conferences and in schools culminated in Congressional hearings and the passage of the Comics Code Authority. The Code became the first manifestation of self-regulation of the comic industry in accordance with social requirements. This form of political compromise through compliance with content standards was intended to promote a normative culture and consolidate the social authority and legitimacy of comics as such (Deverell, 2021; Greenberg, 2022). According to researcher R. Deverell, ironically, The Comics Code gave protection to authors who saw comics as political art rather than entertainment:

"The writers of these stories wanted to reach their readers as individuals who could each find their own meaning in the stories rather than produce a product that offered the same generic entertainment to anyone who purchased it at the newsstand. In doing so, they sought to elevate their own status as artists, escaping from "low culture" and joining the ranks of "high culture" (Deverell, 2021, p. 2).

Despite devastating criticism and protests against the Comics Code Authority, it was finally ignored by the producers and the cancellation of the famous Comics Code seal only happened in 2011.

The authors of the "Classics Illustrated" series from the Gilberton Company (1941–1969), which had nationwide distribution and actively used the comic as an *educational tool* to popularize the reading of classic works of world literature, also tried to promote the spread of knowledge and attract children to reading. Innovative approaches were notable: the creation of an original adaptive scenario (this series differed from the classic illustrations of literary works), the universally recognizable stylistic unity of the cover design, additional spin-off "Classics Illustrated Junior" (1953), "Classics Illustrated Special Issue" (1955), and "The World Around Us" (1958).

"The World Around Us" series (1958–1961) became one of the first systematic educational and popular projects. Each issue was devoted to a separate direction: legislation, communication, the army, the FBI, the Civil War, space, great discoveries, etc. The creation of a holistic view of various aspects of human activity, politics, and society has become a hallmark of the entire series. The compositional structure of individual issues, where the history of discoveries was illustrated by real events in the development of the industry and biographical stories, also fundamentally differed from the traditional encyclopedic presentation. Each story was based on factual material and was presented in the shortest possible, but plot-complete form. In this way, scientific discoveries were connected with the development of progress and human actions at the same time. A military man, a pioneer, a scientist, and a test pilot became the heroes of

whole industry narratives, science from the unknown and the unknown became humanized, alive, and close to the reader. The plot highlighted everyday life with unusual events and the romance of exploring new horizons of knowledge: from the history of the Crusades and medicine to the exploration of outer space and the classified work of the FBI.

Let us add that the educational comic and the use of the art of sequential images in pedagogy and education is perhaps the richest direction in scientific research (Farinella, 2018; LeBlanc & Irwin, 2018; Puput, Ahmadi, & Rochmad, 2021; Alie, Ilhamdi, & Saputra, 2021), but the pedagogical system of art-integrated education, spread at the state level, for example in the USA and India, actively includes comics in STEM education programs today.

Comics were also ordered by large companies. Thus, the series “Adventures in Electricity” (1946–1950) was created for the General Electric Company, which popularized the history of the formation, development, and future of electricity, and introduced young readers to the everyday experience of using light. The habituation of scientific discoveries continued in 1947–1959 with “Adventures in Science” series with a greater thematic variation: the history of aircraft construction, the development of atomic energy, engineering, stories about the creation of rockets, and space exploration. There are clips of interviews with famous scientists, and more and more often pictures of the future are placed on the pages of comics, where technologies radically change medicine, agriculture, industry, technology, and life in general. A cluster of historical comics (“Adventure into the Past”, 1949; “Real Life Comics”) easily combined national and world history and time travel became a common method of immersion in the familiar symbolic details of the world of the past. The plot and compositional innovations became noteworthy: the dialogic nature of the story, the presence of a hero, traditional for educational comics, with whom the young reader could easily associate himself. In the non-fiction genre, four issues of “Marvels of Science” were created, where reality, fiction, and creative imagination were combined within one comic: the exploration of the depths of the sea alongside the biography of Niels Bohr, the experiences of creating prototypes of a jet plane and hunting a rhinoceros (No. 1, 1946).

As a mediator and mediator of scientific ideas, today comics are part of a powerful publishing industry, a field of experimental educational programs, commercial projects, and author's initiatives. This direction has an additional vector: the dissemination of the results of the activities of scientific institutions, international organizations, and ministries to a mass (including youth) audience. In the typology of this huge content, we will name the most significant ones:

- a cycle of graphic histories “Astrobiology: The Story of our Search for Life in the Universe” (2010–2022) was created by order of NACA (<https://astrobiology.nasa.gov/resources/graphic-histories/>);

- a series was created in cooperation between NACA and the Japan Aerospace Exploration Agency “Raindrop Tales: GPM Meets Mizu-Chan” (2014) (<https://gpm.nasa.gov/education/comics>);

- The European Environment Agency popularized its activities in a cycle “Eco

Agent's website" (2007–2008);

- comics commissioned by the Scientific Committee On Solar-Terrestrial Physics (SCOSTEP) were devoted to several topics in Solar-Terrestrial Physics and were translated into 14 languages (<https://scostep.org/space-science-comic-books/>);

- half a million subscribers and 200 comics contain the resource phdcomics.com, which tells about the life and scientific research of graduate students and young scientists.

Even the respected "The Lancet" drew attention to the empathy and informativeness of the comics "have long been part of the visual culture of medicine: a strength of comics is that they present this information through engaging visual storytelling that can place the reader into the experience and contextualize the impact of contagion" (Callender, Obuobi, Czerwiec, & Williams, 2020).

The comics has remained a means of popularization to this day, actively combining education, entertainment, accessibility, and recognizability of the main characters of the series. Of course, the audience of such works is aimed mostly children and adolescents, and it has its own scientific methods of analysis and measures of effectiveness with corresponding caveats and cognitive consequences (Jee & Anggoro, 2012). But especially children and teenagers, future scientists, engineers, writers, technologists, researchers and those who were simply indifferent to new discoveries fell under the charm of comics and replenished the baggage of scientific knowledge by reading popular comic series. In the lecture "Science Comics Can Save the World!" the famous scientist and author of science comics Dr. Jay Hosler noted that it is children who are not afraid to combine curiosity, creativity, and stories that will be able to save the future. "And comics will help them in this" (Hosler, 2018).

Summarizing this first stage, we note: popular science and educational comics clearly defined their audience and visualized the goal of spreading knowledge through a format familiar to teenagers, compositional and stylistic simplifications, and a clear plot. In them, technical, natural, and historical discoveries easily fit into the romance of travel (even at times) and adventure. This potential has remained in demand at different times and in different industries and countries (Tatalovic, 2009). At this stage, the comic book acquired a new meaning in mass perception as well – its powerful educational potential made it possible to see in it the prospects not only of expanding knowledge for teenage audiences but also in scientific communication in general.

Stage II. Interdisciplinary discourses and practices: comics as a tool for scientific research.

The mass perception of comic technique as a means of popularization made it possible to bring comics into the space of academic science. Today we can talk about the stratification of this process into separate directions: the study of comics as a separate field and even a discipline and the use of comics as a tool for presenting scientific research, more broadly, for the development of scientific communication (see the scheme in Figure 1).

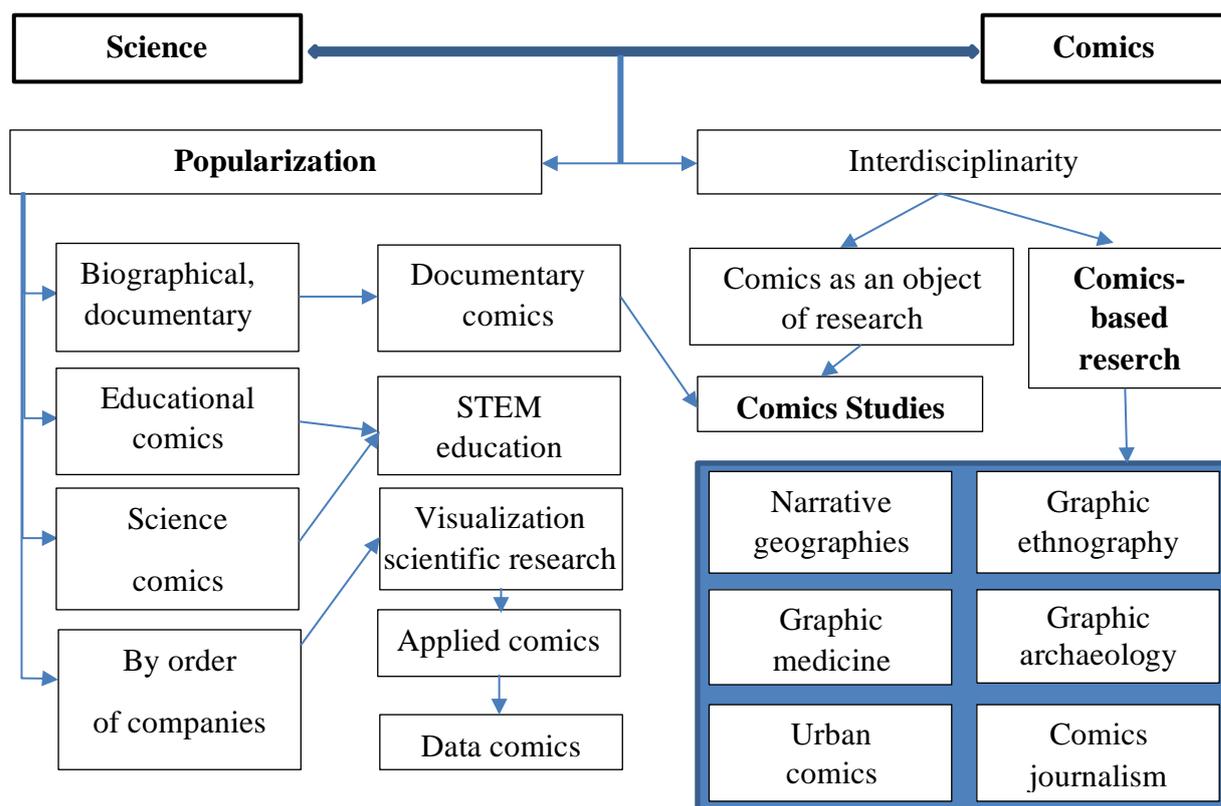


Figure 1. Scheme. Structure of interaction between science and comics.

The phenomenological nature of comics is the subject of research by the world scientific community, and the attempt to avoid “professional blinders”, establishing new channels of scientific communication (Jonsson & Grafström, 2021) is rapidly expanding the space of interfering diffusion forms and interdisciplinary innovations. In 2015, the interdisciplinary laboratory of the Humboldt University of Berlin organized the international symposium “Science meets Comics”. The unanimous opinion of researchers from various fields about comics as a universal means of communication and presentation of global problems was indicative (Leinfelder, Hamann, Kirstein, & Schleunitz, 2016).

Today, a new interdisciplinary area of methodological practice – comics-based research (CBR) – is proposed for discussion, and rather, for legitimization. The definition of CBR as an interdisciplinary methodology and a new practice field was proposed by American researchers P. Kuttner, M. Weaver-Hightower, and N. Souzanis in 2020: “CBR is neither a research methodology (a broad conceptualization of how to approach research) nor a method (a specific practice conducted during research)” (Kuttner, Weaver-Hightower, & Souzanis, 2020). The methodology went from the analysis of the cultural, semiotic, and communicative nature of the comic to the understanding and effective use of it in various fields.

We have already analyzed various features of using CRB as a method of additional visualization of research results and the common practice of collaboration between scientists and comic artists (Hudoshnyk, 2022a). British researcher S. McNicol suggests using comic techniques at various stages of research: documents

in the form of comics (information sheet, summary sheet, questionnaire); an interview based on a comic drawn by the participant; creation of a comic based on an interview with a participant; discussion of different comic book interpretations (McNicol, 2019). The scientist demonstrates the practices of embodiment in the project “Research: Graphic Lives” from Manchester Metropolitan University involves graphic narratives in “arts-based research methods to explore social issues and well-being with a focus on community narratives and individuals' stories” (Research: graphic lives, 2017).

Such approaches are actively used in a wide variety of modern projects by universities, art schools, libraries and public organizations. For example, scientists at Newcastle University demonstrate the effectiveness of using comics as a presentation tool for research and creative student initiatives, when developing thematic sites, supporting materials for lessons or performances (Newcastle Science Comics: “Gertrude Bell Comics”; “Freedom City Comics”). Interdisciplinary explorations are conducted in parallel with making comics as a way to disseminate research. “Newcastle Science Comics” projects on the creation of scientific comics were the result of joint work with museums, libraries, and galleries. The resource “Applied Comics” (appliedcomicsetc.com/) offers collective cooperation academics, public figures and comics artists with integrated comic projects taking into account the target audience (“Strike comics”; “Learning framework: Freedom City Comics”, 2018) (Wisocki, Murphy, & Murphy, 2021). The initiator and active participant of the association Lydia Wysocki (2022) in the methodology of using comics as a research is based on multimodal and sequential (multimodal and sequential) methods: planning; data elicitation, collection, transcription and analysis; dissemination and engagement.

Data Comics, represented by a collaboration of universities in Canada, the United States and the United Kingdom, offers a proven algorithm for cooperation between researchers and comic artists in creating presentations and scientific reports (datacomics.github.io).

CBR is growing fastest in industries where “narrative construction is a core practice” (Kuttner, Weaver-Hightower, & Sousanis, 2020). The study of narratives is a powerful tool for broadening ideas about the possibilities and criteria of CBR in general, and the peculiarities of national narratives in particular (Chang, 2021).

CBR methodologies within individual industries are highlighted. Thus, *graphic medicine* is defined as an interdisciplinary approach to telling personal stories about illness and health through the use of comics, and according to the founders, it is “a movement for change that challenges the prevailing methods of health care, offering a broader view of medicine, illness, disability, and care” (The Graphic Medicine Manifesto, 2015). The direction is represented by a very active international community (see graphicmedicine.org), a powerful corpus of medical comics and pathographies (Wegner, 2020), annual conferences, educational modules, master's programs of medical educational institutions in Europe, the USA, Canada, Japan within courses in narrative medicine and Health Humanities. The educational and media activity of the community is impressive: cooperation with well-known publications (the weekly comics “Sick Notes” for “The Guardian” was drawn by Ian Williams, the founder of the direction), creation of own projects with ready-made comics for training

medical workers, for social and educational campaigns (artibiotics.com). The pandemic has actualized this cluster of graphic narratives (see, for example, “Comics for Good” resource, “The Moment” series by Singaporean artist Sonya Liu, “The Vitals: True Nurse Stories” by Marvel Comics, etc.).

Narrative geographies offer the dissemination of geo humanities and the creation of comics as a graphic practice of conducting research. An example of such geographical narratives was the comic anthology “Quartieri: Viaggio al Centro delle periferie italiane” about five districts of Italian cities. Geographical and ethnographic field research is embodied in the direction of Graphic mobilities, Urban comics (Peterle, 2021; Cancellieri & Peterle, 2021), and graphic ethnography (Forde, 2022).

The combination of *archeology and comics* is today presented in the directions of transmedia archeology (Scolari, Bertetti, & Freeman, 2014), and educational methods (Kamash, Soar, & Van Broeck, 2022; Swogger, 2022). The involvement of CBR is demonstrated both by well-known researchers (“Shovel Bum: Comix of Archaeological Field Life”, 2004) and by the authors of a popular scientific graphic novel for “National Geographic” (A. Maleev and M. Furlong “The Killing of the Iceman”, 2011).

In the modern dictionary “Key terms in comics studies”, the presented varieties are called Applied Comics: “*Applied comics are comics with a specific job to do. They communicate information to a target AUDIENCE, a goal that shapes choices made throughout the comics-making process and differs from a general category of non-fiction comics. Applied comics are typically made as a COLLABORATION between subject specialist(s) and comics CREATOR(S), although one person might take on both roles*” (Cour et al., 2021, pp. 20–21).

The effectiveness of the interaction of scientific fields and comics was based on its main qualities: ease of perception due to the simultaneous involvement of familiar and new discourses; narrativity – graphic storytelling and narrative style are very common in the information space; metaphorical thinking as a cognitive tool (Farinella, 2018; Kuttner, Weaver-Hightower, & Sousanis, 2020).

A special cluster in the indicated direction was the use of CBR when examining the comics themselves. It should be said that such an unusual tradition is based on the uniqueness of the constant involvement of comic book authors in the research activity. Scott McCloud, a well-known master of non-standard techniques and approaches, published “Understanding Comics: The Invisible Art” in 1993, there by starting the tradition of talking about comics in his own language. In 2010, Jason Helms was the first to defend a scholarly work involving comics techniques (Helms, 2010). In 2014, Nick Sousanis completed the dissertation “Unflattening” at Columbia University. The unusual thing was that all 132 pages were comic panels – the author saw a special metaphorical in this form of argumentation of the main thesis of his work about the importance of visual thinking in teaching and learning (Sousanis, 2020; Sohini, 2022).

In July 2014 “Critical Inquiry” creates a unique “Comics and Media” issue, including scholarly texts, an interview with Art Spiegelman, a panel discussion with Phoebe Gloeckner, Justin Green, Aline Kominsky-Crumb, and Carol Tyler, and comic pages by Alison Bechdel, Lynda Barry, Seth, and Phoebe Gloeckner. The number itself

in digital form became the first to analyze the comic together with the comic artists in the form of a graphic anthology. In 2015, the Special issue of Digital Humanities Quarterly “Comics as Scholarship” presents an issue already fully adapted to digital requirements, boldly experimenting both with comic style in the presentation of articles and outlining the problems of digital scientific communication within CBR.

The spread of the use of CBR in scientific practice is also confirmed by the appearance of new types of scientific journals. Corresponding to the logic of their research object, they offer material with the active involvement of drawings, comic panels, strips, and articles in the form of separate comics and cycles. “The Comics Grid: Journal of Comics Scholarship” has existed as a comics studies blog since 2010, and today, despite the unusual form, is an academic publication with appropriate standards. “Sequential” magazine publishes research in comic format on a variety of issues: art reviews, analysis of postmodern reality, polysemy, queerness, history of materiality, etc.

The practices of combining comics and science in the Ukrainian space are mostly related to the visualization of encyclopedic projects (“Illustrated history of the independence of Ukraine”, “Constitution in comic” by the Kapranov brothers), comic book adaptations of works of classical Ukrainian literature (“Classic comics” series by the Grani-T), creating scientific comics (a series of books “Science comic” from Ranok publishing house) and a powerful market of translated scientific popular literature. At the same time, one cannot fail to note the bright projects of 2021–2022. Among them is “Defense of Zamostia. The Legend of the Shovel” (2021) – the first historical comics created on the initiative of the Ukrainian Institute of National Memory. As in most historical comics, interesting facts about the described events, excerpts from documentary chronicles, and biographies of the actors are presented at the end of “Defense of Zamostya”. Combining factual reliability, artistic fiction, and fantasy, despite the controversy, is becoming a common practice in Ukrainian historical-documentary and military comics (Hudoshnyk, 2022). In 2022, the work of young Ukrainian researchers and artists “A Brief History of Ukrainian Feminism” (Yabchenko, 2022) was published, which to some extent broke the CBR tradition of using comics only as a means of visualizing content. Despite a certain schematic and the color monotony inherent in social and documentary comics, the authors actively experiment with the plot, figurative symbols, archival inserts, and historical time. Thanks to the uniqueness of the comic chronotope, the authors manage to tell the story through life actions, dialogues, and gender myths and clichés familiar to the mass reader. Dynamic and full of facts, a short excursion into the history of Ukrainian feminism successfully demonstrates the other side of CBR: the comic has its own logic and meaningful structure. Not taking it into account means simultaneously losing the significant potential of comic storytelling and “meaning-making in research” (Thornborrow & Gosse, 2020, p. 116).

Stage III. From research field to discipline: the genesis of Comics Studies.

In the genesis of scientific approaches to the analysis of comics as an object of research, cultural studies turned out to be the most friendly to the new genre, which is

why the list of founders of interest in the new art form looks so diverse. In 1923, Gilbert Seldes, in his book “The Seven Lively Arts”, names Slapstick Moving Pictures, Comic Strips, Revues, Musical Comedy, Columns, Slang Humor, Popular Songs, and Vaudeville as the antithesis of classical arts. In the section “The ‘Vulgar’ Comic Strip”, the author writes with irony: “Of all the lively arts the Comic Strip is the most despised, and with the exception of the movies it is the most popular” (Seldes, 1923, p. 213). But the definition of comics as the 9th art form, made by the famous French critic Claude Beylie based on the analysis of the European comic strip *Bande dessinée* (Beylie, 1964), has become popular today. 1964 also dates to the books of famous philosophers Roland Gérard Barthes (essay “Rhetoric of the Image”) and Umberto Eco (“Apocalittici e integrati”), which started the direction of research into the semiotics of comics.

The scientific understanding of the comic chronologically coincided with the flowering of the comic itself “the art of sequential images” in the late 1930s. Thus, in 1942, Paul Cassidy defended the first scientific paper “An Approach to the Profession of the Comic Strip Cartooning Based Upon an Analytical Survey of Current Trends and Personal Experiences” at the University of Wisconsin. The study was based on an overview of the practices and methods of the comics industry, but most interestingly, it included the personal experience of the author and the results of a survey of the most famous masters of the industry at the time (Ricca, 2014).

Traditionally, the first collection of scientific articles on comics is considered to be a special issue of the “Journal of Educational Sociology” (1944, Vol. 18, No. 4), the section of which was devoted to the use of comics as a teaching method. Despite the guiding idea to study comics as a “great new medium of communication and social influence” (Zorbaugh, 1949), for many years the subject of systematic the comic did not become of scientific interest due to academic snobbery and the “unseriousness” of the research object: *“While visual narratives were embraced in other cultural environments – the French bandes dessinées or the Japanese manga – the obvious popularity of early comics raised suspicion rather than academic interest, and scholarly attention to what French critics have long referred to as the ‘ninth art’ emerged very slowly”* (Domsch, Hassler-Forest, & Vanderbeke, 2021).

A powerful explosion of scientific interest was caused by several circumstances. The spread in the second half of the 20th century in the countries of Western Europe of graphic novels, l'album, comic book made it possible to include comics first in the “legitimate cultural practice of middle-class reading” (Gabilliet, 2005), and due to the “respectability” of the analysis of the novel structure – in the literary, and then multidisciplinary practices. The appearance of William Erwin Eisner's comics, first of all “A Contract with God” (1978), which is called the first graphic novel, became iconic for the direction. Harvey Pekar's “American Splendor” series (1976–2008) pioneered the trend of documentary comics and autobiographical narrative in comics culture. Art Spiegelman's Pulitzer Prize-winning novel “Mouse” (1992) was a milestone in the recognition of comics' right to represent the most complex political and social issues. A separate direction of comic journalism dates back to 1993 with the publication of Joe Sacco's graphic novel “Palestine” in the reportage genre.

The second reason for the active interest in comics was the superheroic film industry, which is exceptional in terms of audience, profits¹ and global distribution: “widespread interest in heroic narratives and increasingly diverse representations of heroic power in comic media remains an enduring impulse over decades of cultural production and across multiple visual platforms” (Cour et al., 2021). It actualized both the interest in already known comics and contributed to the intensification of the development of national comic cultures and publishing strategies (including in Ukraine). The first attempts to form the academic discourse of Comics Studies as a field of inquiry date back to the early 2000s: specialized publications, electronic library archives, inter-university thematic international conferences, university special courses, and educational programs appear (Cour et al., 2021).

Quantitative indicators of critical discourse are growing rapidly: comics are becoming a space of interdisciplinary and an object of scientific interest in various directions of humanitarian studies. Figure 2 shows a selection from the Scopus database of articles for the period 1936–2022 that use the keywords “comics studies” or “comics” in their titles, keywords, or abstracts.

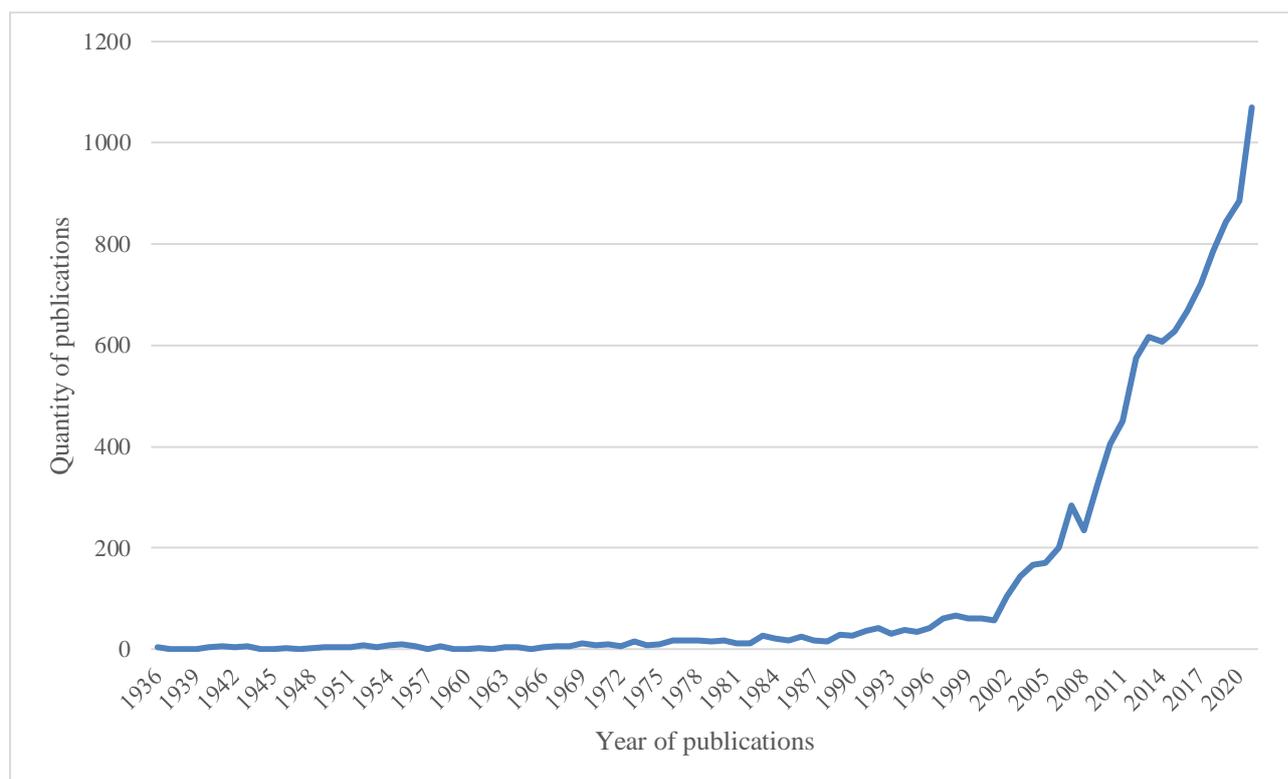


Figure 2. Dynamics of publications on the topic “Comics” (compiled by authors based on data from the SCOPUS database (2022)).

¹ Of the 10 Top Lifetime Grosses Movies in the World, five are based on comic books. According to box office mojo, their total revenue is more than \$10 billion. Source: based on https://www.boxofficemojo.com/chart/ww_top_lifetime_gross/?area=XWW&ref=bo_cso_ac

Further development was evidenced by the academic recognition of a new field of research:

- creating associations of scholars to study comics: American “The Comics Studies Society” (2014) with its own journal (Inks: The Journal of the Comics Studies Society) and a wide field of scientific interests, the German “Gesellschaft für Comicforschung” (ComFor, 2014), the “International Bande Dessinée Society” (2012), the “British Consortium of Comics Scholars” (2012), “Scottish Center for Comics Studies” at the University of Dundee (2011), “Canadian Society for the Study of Comics” (2010);

- printing of terminological dictionaries of the discipline (“Keywords for comics studies”, 2021; “Key Terms in Comics Studies”, 2021);

- master's and PhD programs at universities in the USA, Great Britain, European countries;

- international associations, platforms, and hubs (see e.g. Comics Research Hub (CoRH), University of the Arts London, 2019);

- dozens of monographs and defended dissertations (more than 20 in 2015–2016 alone), entry into the Scopus metric system of three editions “Journal of Graphic Novels and Comics”, “Comics Grid”, “Studies in Comics”.

Gene Kannenberg, chairman of the International Comic Arts Festival (1999–2000), made the first attempt to structure the scientific comics discourse on the portal www.comicsresearch.org. Later, the international status of powerful open databases of comics (for example, 400,000 indexed issues in The Grand Comics Database (GCD), the active involvement of volunteers from all over the world made access to online bibliographies global, and the dynamics of the development of Comics Studies were evident (for example, Bonn Online Bibliography of Comics Research international bibliographic database for scholarly literature about comics).

Gradually, the main directions of research into comics, graphic novels, strips and their cross-platform implementations in animation, digital media, and film were determined: comic theory, history, philosophy, semiotics, and criticism can only be singled out very conditionally. This contributed to the formation of a disciplinary context, and, as usual, an active scientific discussion of the principles of functioning, philosophical foundations, markers of the boundaries of a new discipline, and ethical problems when using the latest methods (Fawaz, Whaley, & Streeby, 2021; McNicol, 2019).

In February 2015, in an interview with “The Guardian”, Christopher Murray, the founder of the first master's program in Comics Studies at the University of Dundee (Scotland, United Kingdom), recognized the initial level of development of the scientific direction (under-developed area) due to the lack of a canon and the urgent need for innovative and interdisciplinary approaches. At the same time, he drew attention to the possibility of new methodologies to “break down disciplinary divides, work in the space of intersection of literature, art, history, politics, media” (C. Murray Comics studies has been undervalued for too long: We're fighting to change this. *The Guardian*. 2015, February 18.). In addition to the already-known educational opportunities, the author recognized creativity in solving the very problem of setting

tasks and methods of solving them as promising.

Within the framework of the history of science, this discussion is all the more revealing, since it takes place practically online, and comics act as “an aesthetic medium that also doubles as a conceptual terrain upon which the most central concerns of humanistic inquiry have and continue to be spectacularly rendered” (Fawaz, Whaley, & Streeby, 2021).

The accelerated development of the newest field, the active involvement of young and ambitious scientists in its development allowed Roger Sabin, editor of the “Palgrave Studies in Comics and Graphic Novels” series, to see the rapid transition of Comics Studies from a marginal interest to a disciplinary level: *“This series concerns Comics Studie – with a capital “C” and a capital “S.” It feels good to write it that way. From emerging as a fringe interest within Literature and Media/Cultural Studies departments, to becoming a minorfield, to maturing into the fastest growing field in the Humanities, tobecoming a nascent discipline, the journey has been a hard but spectacularone. Those capital letters have been earned”*.

Questions of disciplinary autonomy and scientific legitimacy are constantly raised by the young branch. “The Oxford Handbook of Comic Book Studies” (Aldama, 2020) presents the basic scientific mechanisms of disciplinary formation in a debatable and critical dimension. Drawing attention to the impossibility of self-sufficiency and closure of any scientific direction, Ch. Hatfield (2017) even introduces the characteristic of anti-disciplinarity as something that makes it impossible to define boundaries: “our field defies or at least seriously questions the compartmentalization of knowledge that occurs within academia”. But in 2020 he publishes a guide to comics studies (Hatfield & Beaty, 2020), which is nominated for the next year's Eisner Awards for the best academic/research paper, thus ironically revealing the metaphor of anti/inter/indisciplinarity and giving credit to “the field of comics studies has exploded” (from the abstract).

The birth of a new discipline, its separation and self-identification, despite the huge discourse of academic texts, the increase of thematic scientific journals, the opening of doctoral and master's programs in universities, is still a subject of debate – from Hetfield's anti-disciplinary approach to the rigid rejection of academicism by a large cohort of art fans and connoisseurs. Moreover, the history of the direction's development does not look like a traditional historical scientific path, constantly being in the space of paradigm shifts (paradigm shift) depending on the prism of scientific research (Cour et al., 2021, pp. 67–68).

In this sense, the history of Comics Studies stands as an antithesis to the traditional process of accumulating scientific experience. Benjamin Woo, pointing to the “paradigmatic status” of the discipline rhetorically asks: Where on the ancient and gnarled Tree of Knowledge shall we graft this new branch? (Woo, 2019). One cannot but agree with the researcher that even in the genesis of the emergence of the new discipline depended on unusual initial influences: comics writers and fans rooted the practices of critical studies of comics through their own attempts at the first generalizations. Subsequently, Comics' rehabilitation as both “literary” graphic novels and transmedia entertainment franchises has translated into a new confidence in their

“plausibility” as objects of scholarly attention. But the problem is more than defining disciplinary fields and boundaries: *“When we say that comics studies is a field, we are pointing to an intellectual community of people who have something to say about comics. To be a discipline, comics studies requires a metadiscourse, a backchannel where we can talk about how we talk about comics. The point is not to suppress or explain away difference but to focus in on the differences that are consequential and the debates that are worth having. Heretofore, our conversations about disciplinarity have largely been focused on the institutional appurtenances thereof—the “paraphernalia” of journals, learned societies, conferences, and, yes, faculty jobs. These are certainly important conversations to have if the achievements of comics scholars over the decades are to be sustained and carried forward by future generations. But we can’t neglect other, perhaps more difficult conversations about what comics studies has been, is, and could be”* (Woo, 2019).

Interdisciplinarity itself, as a core characteristic of comics research, is defined by most researchers as a “commonplace” and affects the scientific discourse of a widely divergent field (Jacobs, 2020), with a plurality of non-integrated and not always complementary methods (Dunst, Laubrock, & Wildfeuer, 2018).

As a way of creating a metadiscourse of a scientific direction through sustained, reflective, and collective effort, to expand the boundaries of the canon, legalized, usually, by literary approaches in the analysis of a documentary comic (we are talking about “Maus”, “Persepolis”, and “Fun Home”), to include audience-oriented methods of media studies in reflective practice. Thus, Jacobs offers an interdisciplinary tripartite approach that considers comics “as texts, material objects, and the locus of commercial and cultural transactions” (Jacobs, 2020).

Neil Cohn, a well-known researcher of comics, proposes to study them with a focus on the theory of visual language (Visual Language Theory), relying on the methods of cognitive and linguistic sciences and cross-cultural studies. The scientist supports the analysis of the multimodality of comic structures by creating the Visual Language Lab and curating the ambitious TINTIN project, which plans to analyze 1,000 comics from 75 countries of the world (<https://www.visuallanguagelab.com/>) using MAST (The Multimodal Annotation Software Tool), 4,200 pages of comics from 36 countries have already been analyzed, establishing interim results of a global study of cross-cultural patterns in the visual language of comics (TINTIN Project: Progress on Panels, 2022).

In this space of heated debates and scientific polyphony, Ukrainian comics today are taking a unique path of simultaneous formation of polythematic comic content and the initial formation of interdisciplinary academic discourse. The first is expressed by the creation of an active community and the formation of modern comic culture, the emergence of the national comic tradition and the expansion of the publishing market. The second is currently undergoing the traditional stage of an interdisciplinary approach involving philological, pedagogical, publishing, and communication methods. In January 2022, defended the first dissertation in Ukraine, “Ukrainian comics: library and information dimension”, specializing in information, library and archival business. Its author, Belov D., chronicled the history of Ukrainian comics:

humorous and propaganda comics of the 1920s–1930s (“Chervonyi Perets”, “Komar”); underground and emigration comics (1930s–1950s); Soviet Ukrainian comics of the 1950s–1970s with an emphasis on children's comics (“Perchenya”, “Barvinok”, “Malyatko”); Ukrainian comics at the beginning of Ukraine's independence (1990s–2010s) and, finally, contemporary Ukrainian comics (Belov, 2021). Considering the issues of the work, the national strategies of comic criticism and the formation of a library and information service around comic culture are summarized for the first time.

Conclusions.

Therefore, at the first stages of cooperation between science and the art of sequential images, the visual rhetoric of comics organically fit into the audience habits and traditions of mass culture. The desire to interest and expand the audience made popular science, and biographical series vivid, scientific discoveries were presented in a traditional heroic style, and scientists became real saviors and role models. The direction of popularizing research through comic techniques today has taken various forms, and the purposeful use of CBR has become a common practice of both individual scientists and universities, scientific laboratories, libraries and institutions.

The newest scientific field of comics research has gone through various stages of its formation, first in a harsh confrontation between high and low culture, then in an ambivalent combination of entertainment and education, with the further development of philosophy, theories and histories of comics. These stages and scientific components did not always develop consistently, and even more so, they did not cancel previous acquisitions and, unfortunately, prejudices. The comic is unique in its exceptional appreciation for successful decisions, it actively replicates them at different times, and offers to relive familiar experiences, and implements tried and tested ideas in new forms.

It is quite logical that on the path of various vector directions of scientific understanding of comics, there will be attempts to unite them into a single disciplinary space, following the example of traditional crossovers and Multiverses of well-known comic's epics. At the same time, the first results of a comprehensive analysis of the “living reality of the world of comics” (Woo & Stoll, 2021) point to the extremely difficult task of modern dialogue between comic artists, readers, publishers, scientists, critics, and journalists in understanding the comic and the scientific space around it.

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Наука і комікси: від популяризації до дисципліни Comics Studies

Анотація. Сучасна наукова комунікація традиційно використовує візуальні наративи, такі як комікс, задля освіти, презентації наукових здобутків масовій аудиторії і як об'єкт дослідження. В статті пропонується трирівнева характеристика взаємодії коміксової культури та науки в діахронічному аспекті. Акцентується увага не тільки на хронологічних етапах цих перетинів, увиразнення специфіки взаємодії пропонується на тлі наукових і громадських дискусій, що супроводжують діалог комікс–наука і до сьогодні. В межах першого етапу (поява і поширення науково-популярних та освітянських коміксів) виокремлені важливі для подальшої генези характеристики комікс-контенту: документальний сторітелінг, освітянські практики навчання через малюнок, активна співпраця з відомими компаніями та закладами, інформативність та емпатична залученість молодого читача до героїко-

романтичного наративу наукових відкриттів та освоєння природи. З активізацією міждисциплінарних підходів (другий етап) комікс все частіше залучається до презентації наукових результатів в межах найрізноманітніших галузей. Comics-based research становиться міждисциплінарною методикою та поширеною практичною сферою з відповідним формуванням наукового інструментарію (прикладний комікс, дата комікс), формами міждисциплінарної взаємодії (графічна медицина, етнографіка, наративна географія, урбаністичний комікс, коміксова журналістика тощо) і науковими виданнями (“The Comics Grid: Journal of Comics Scholarship”, “Sequentials”). На прикладі українських коміксових проєктів (історичний, феміністичний комікс) представлено національний формат comics-based research. У генезі розвитку comic studies пройшли шлях від поля досліджень до дисциплінарних дефініцій. У створенні метадискурсу наукового напрямку (третій етап) авторами зосереджено увагу на наукових дискусіях, формуванні академічних напрямів і підходів та на маркерах дисциплінарної самоідентифікації. Закцентовано на унікальному феномені одночасної суголосності різних етапів діалогу коміксу та науки, на подовженій реплікації вдалих винаходів у сучасний досвід, активна апробація знаних наративів на нових рівнях наукової презентації.

Ключові слова: наукова комунікація; прикладний комікс; дослідження на основі коміксів; дослідження коміксів

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