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Digitality in the Open Science age: practices and genres

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**Abstract.** No matter where we are in the revolution versus evolution debate, digitality has undoubtedly brought about radical changes of practices and genres. Today digital genres born in the Internet age as New Media resources (science news reports or science blogs) compete with a traditional print-based genre of a research article. Although few works have synthesized the interaction of these “old” and “newly-born” genres, the Open Science digitality context has not received considerable treatment in genre scholarship, and little attention has been given to such features of scientific genres as multimodality, interdiscursivity, participatory culture. Thus, the relevance is in the reconceptualization of the Open Science practices and classifying the Internet-born genres of science communication. The qualitative method of discourse analysis is used in the lens of the social semiotic and the social genre theory proposed by the New Rhetoric School. As a result, four groups are suggested: research genres, promotional genres, trans-scientific genres, presentational genres. As a result of the analysis, we have come to the following conclusions. First, hybridization penetrates all the discourse and language levels: written discourse is combined with oral discourse, scientific style – with spoken style, scientific discourse – with journalism. Second, multimodality competes with the writing-based space, thus getting the potential of a meaning-making tool. As a result, the concept “science” has been reconsidered; science has become not only the professional community property but an active area of engagement with other fields and audiences in the process of science popularization. Digitality serves more than a medium and genres are not only recontextualized but gained more complexity.

**Keywords:** Digitality; Open Science; Genre; Science communication; Multimodality; Interdiscursivity; Participatory culture; Science popularization

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| Дигитальность в эпоху Открытой науки: практики и жанры

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**Аннотация.** Независимо от многолетних споров, представляется ли научная коммуникация в цифровой среде революцией или эволюцией, можно уверенно сказать, что дигитальность принесла с собой смену практик и жанров. Сегодня цифровые жанры, зародившиеся в Интернет-эпоху в недрах новых медиа (к примеру, научные новостные тексты или блоги на научные темы), конкурируют с традиционным жанром исследовательской статьи. Несмотря на то, что немногочисленные работы обобщают опыт взаимодействия этих старых и недавно появившихся жанров, дигитальность в контексте Открытой науки не получила достойного освещения в научных трудах, посвященных жанровому анализу, наряду с такими характеристиками научных жанров, как мультимодальность, интердискурсивность, культура со-участия. Таким образом, актуальность исследования заключается в осмыслении практик эпохи Открытой науки и классификации и анализу жанров научной коммуникации, появившихся или получивших развитие в Интернет-эпоху. Качественный метод дискурс-анализа используется в рамках социальной семиотической и социальной теории жанра, предложенных представителями школы Новой риторики. В результате были выделены следующие жанры: исследовательские жанры, промо-жанры, транснаучные жанры, презентационные жанры. В ходе анализа были получены следующие результаты. Во-первых, мы наблюдаем всеобъемлющую гибридизацию сразу на нескольких уровнях. Письменный дискурс с успехом сочетается с устным, научный стиль – с разговорным, научный дискурс – с журналистикой. Во-вторых, мультимодальность соперничает с текстовым пространством всех жанров и таким образом является смыслопорождающим инструментом. В-третьих, пересматривается само значение концепта «наука»: наука становится не просто достоянием экспертного научного сообщества, а активно взаимодействует с разными аудиториями в процессе научной популяризации. В заключение мы можем сказать, что дигитальность представляется не просто средой, а жанры не просто помещаются в новую среду. Жанры приобретают все большую сложность и многослойность при изменении всех компонентов риторической ситуации.

**Ключевые слова:** Дигитальность; Открытая наука; Жанр; Научная коммуникация; Мультимодальность; Интердискурсивность; Культура со-участия; Научная популяризация

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## 1. Introduction

With the first English-language book printed in Oxford in 1478 (Owen, 2005: 32), after five centuries of printed books, in the 1970s, the humanity had to go through a paradigm shift to Internet-related technologies. These technologies proved to be so influential that scholars worldwide could describe the process as a revolutionary stage in the history of information – the Digital Revolution (Harnad, 1991; Beavers, 2012). There have been two camps of scholars ever since, ranging from those ones with the radical position formulated as “Print is dead” (Gomez, 2008), to the proponents of the evolutionist theories who considered digitalization to be just a radical change towards new practices, genres, and formats of writing (Valauskas, 1997; Rowland, 1999). Digitality, or “being digital” (Negroponte, 1995), has become a lifestyle and the condition of living in a digital culture with its interactivity and sensory richness, asynchronous way of working and processing the on-demand information. The forecast provided by those and many other scholars in the 1990s has turned out to be true. Both the computer design and the Internet technologies have undoubtedly become the source of great changes in the history of writing in general and the science communication in particular.

Both computer and Internet with its digitalization processes have brought about radical changes in the very nature of science communication with its increasing role of popularization of science. The digital age is characterized by the liberation of the text of the “power of print” that resulted in the emergence of new digital genres (blogs, wikis, Ted talks, to name just a few) and the evolution of traditional print genres, first and foremost a research article and its subgenres. Popularization of science involved diversified audiences of experts and non-experts, which triggered the expansion of the concept “science” that encompasses the variety of practices and genres. The practices in the new Internet environment did change the rhetorical situation and its key components:

the writer, the message, the audience, the purpose, and the context.

As a result of the changing rhetorical situation, the evolution of genres has led to the evolution of the genre theory. Born in the literary studies scholarship, the genre theory had the problem of genre classification, started by the influential text of Jacques Derrida (1980). He stimulated a whole discussion on genres as open categories, supported by R. Cohen (1986). Soon the discussion encompassed various discourses beyond the literary one; the Internet speeded up a transition toward a discursive turn, which happened to be underway in the 1980s (Connors, 1981; Miller, 1984; Bazerman, 1988). One of the leading proponents of the New Rhetoric movement defined genre to be “any type of communication in any mode (written, spoken, digital, artistic) with socially-agreed-upon conventions developed over time” (Devitt, 2015: 82). The concept of genre developed its new understanding in the dynamic, professionally oriented system of genres, formed in the digitality constraints. These digitality constraints provide digital affordances as well, and the new concept of genre formed the functional genre theory with a focus on diversity and hybridity (Askehave & Ellerup Nielsen, 2005). The genre theory considers multimodality (the diversity of different modes in the digital environment) and interdiscursivity (the diversity of discourses) as well as the participatory culture to be of great significance.

This article seeks to classify the most influential genres of the modern context of science with the emphasis on digital affordances, multimodality, and interdiscursivity. In the new context of a changing rhetorical situation, we suggest the following multi-perspective classification of scientific genres: research genres, promotional genres, trans-scientific genres, presentational genres. The classification gives food for thought and debate. However, the holistic approach to genre could be interesting to genre scholars and teachers as genre brings together “language, content, and the context

of discourse production and interpretation” (Paltridge, 2001: 2).

Our research questions are the following:

1. What evolutionary transformations has a traditional research article undergone in the Open Science age?

2. How does the participatory culture in the Open Science age contribute to the emergence of new genres (e.g., blogs, science news reports, Ted talks, among others)?

The Results part deals with eight sections that put the digital genres into modern context of science. While section 3.1 addresses the practices of the Open Science age, section 3.2 provides an overview of major scientific genres based on digitality features and a functional criterion. The genres acquire the features of multimodality and interdiscursivity, defined in this section. Section 3.3 examines research in the close interconnection of process and product. The changing practices of peer review in the Open Science age are considered in section 3.4. Section 3.5 focuses on the traditional print genre of a research article “going digital”. The set of genres that are essential for career growth – conference abstracts, conference papers, and conference presentations, along with the grant proposals – are the focus of section 3.6. In contrast to research and promotional genres that are the key ones in expert communication, trans-scientific genres and presentational genres are peripheral and cater the needs of diversified audiences (section 3.7). “Scifotainment” and “edutainment” presentation-based genres are addressed in section 3.8. The final part of the article (Discussion and Conclusions) wraps up the role of digitality in changing practices, while transforming the writer identity and genres.

## 2. Materials and Methods

The method used is a discourse analysis of the most common digital genres related to the interdisciplinary field “science”. Although the close analysis of digital text genres goes beyond the goal of our research, the materials

are diverse text genres constructed in the close interconnection with the research practices and modern context of scientific landscape. Working on our classification of genres, we apply a dynamic, functional genre theory supported by the New Rhetoric proponents.

## 3. Results

3.1 Open Science 2.0 and its main characteristics

The first e-journals formed a new publication model in the 1990s, with its openness, fast data dissemination, low cost, reader-friendliness, ever-increasing transparent practices of peer review.

Such characteristics of e-journals rapidly developed in the Web 2.0 era. Web 2.0 officially started in 2004, with Tim O’Reilly being credited with exploring the early business models for web content and popularizing the concept (O’Reilly, 2005). It is defined by the participatory culture and social interaction that is characterized by the content accommodation for diverse audiences of experts and non-experts. Web 2.0 refers back to Web 1.0 when people used to read the text in the linear, passive mode.

The very idea of Open Science is not new. The principles of Open Science were laid in the 16-17<sup>th</sup> centuries when there was a need for science vernacularization as well as transformation of practices of science communication, having made a shift from the medieval secrecy to modern open science. The understanding of openness in science led to the modern journal publication practice, with developing of “common understanding that it is in the common interest for research results to be openly available to all other researchers” (Bartling & Friesike, 2014: 7).

In 1998, the Open Source Initiative promoted open software. In 2002, the Budapest Open Access Initiative gave all the readers free access to scientific literature, which allowed the readers to upload, copy, and refer to the full-text articles and books without any financial and technical constraints (Swan, 2012). Quite symbolically, such an important

achievement was supported by the Royal Society of London, an active and sustaining promoter of open communication in science. In 2016, the European Commission claimed an important transition from a relatively close, disciplinary, and profession-oriented system to an open interdisciplinary structure in which knowledge production is available for all the members of the society (Amsterdam Call for Action on Open Science, 2016).

Nowadays Open Science became closely interrelated with Science 2.0 movement that emerged to incorporate “new practices of scientists who post raw experimental results, nascent theories, claims of discovery and draft papers on the Web for others to see and comment on” (Waldrop, 2008). The movement has acquired a broad meaning nowadays: “Open Science is necessary broad because it is composed of many dimensions (e.g. along the scientific research process) and embedded in a larger system that involves e.g. new skills, a new reputation scheme, or the wider public” (Prem et al., 2014: 81).

On the whole, Open Science features open data, data sharing, reproducibility of results, and transformative practices of “citizen science” that serves as public engagement.

### 3.2 Genres and their features in the Open Science Age: An Overview

The authors of the 24<sup>th</sup> European Systemic Functional Linguistics conference made a classification of the digital genres: genres that are “born digital” – blogs, Emails, You tube, Facebook. Some genres “achieve digitality” – technical instructions or university lectures. Finally, research articles “have their own digitality thrust upon them” (Alsop & Gardner, 2014: n/p).

In the context of the Open Science, we will focus on the research genres that are the core ones in the “cyberscience” (Nentwich, 2003): those ones that are either “born digital” (preregistered reports) or “have their digitality thrust” upon them (research article with its add-on genres). The 21<sup>st</sup> century encourages researchers to think more about their career; thus, promotional genres that include the

conference set of genres and applying for grant genres – were born in the print age but witnessed great transformations in the digital age.

Both research and promotional genres cater mainly the needs of expert and general educated public. In contrast, trans-scientific and presentational genres disseminate and advertise the results of their research in a popular way. Such genres as Ted talks, press releases, science news reports have their “presentational counterparts” – three-minute thesis presentations (3M T) and public video lectures. These genres are either born digital or have a digitality thrust upon them. Both these two groups of genres cater the needs of general public of Internet viewers.

All these genres have digital affordances that form or change their nature. Digital affordances affect and are affected by the multimodality feature of discourse. Multimodality implies “the multitude of modes that can be understood as systems of visual and verbal entities created within or across various cultures to represent and express meanings” (Serafini, 2014: 12). We can provide a written language, images (moving or still), and sound as examples of “modes”. Multimodality has a great meaning-making potential as “meaning is constructed through selection and configuration of different modes in interactions. It is not only verbal or textual expression that conveys meaning in particular cultures but a whole array of other culturally contextualized semiotic means” (Lyons, 2015).

Interdiscursivity is one more important feature of modern scientific discourse. According to V. Bhatia, interdiscursivity is “more innovative attempts to create various forms of hybrid and relatively novel constructs by appropriating or exploiting established conventions or resources associated with other genres and practices” (Bhatia, 2010: 35). Such an appropriation deals with semiotic resources among which Bhatia names “textual, semantic, socio-pragmatic, generic, and professional” and are related to

“genres, professional practice and professional culture” (Bhatia, 2010: 35). Interdiscursivity depends on text-external factors (professional and social context) and influence text-internal factors of the text genre.

In sum, digital genres share borrowed digital affordances and develop multimodality features. Remediation of text genres (from print to Internet environment) managed to change both text-external and text-internal factors, which has led to interdiscursive hybridity of genres.

### 3.3 The process of research in the Open Science age: Practices and emerging genres

Open Science is “open” in the very process of research – from the very choice of the topic and the search of funding, data gathering, analysis of data – to the publication as the product of research.

The first stage of research deals with the need to seek funding, which in many cases predetermines the topic and even the strand of the research. Crowdfunding platforms, such as *Kickstarter*, *Experiment*, *RocketHub*, *Scistarter*, are essential for an emerging genre of a crowdfunding proposal that often serves as an alternative of the traditional genre of a grant proposal as it uses the multimedia technologies – video presentation of an individual or a collaborative project. It is a good chance for researchers working primarily in the field of life sciences to advertise and promote their project as well as reach out wider audiences.

Stage 2, the process of data gathering, is an important feature of an observational and experimental article when scientists use various resources, including lab robots, in the process of data collection. As soon as the scientific research is widely conducted in large international collaborations, lab notebooks and lab reports are organized on such websites as *labguru.com*, among others. Stage 3 is data analysis, making hypotheses, propounding theories with an active participation of AI, data mining, and various interactive and visual systems of data analysis. The product of Stage 3 is the genre of a registered report. A registered report is an emerging, hybrid genre

that proceeds through a two-stage model of peer review. It is “a form of journal article in which methods and proposed analyses are pre-registered and peer-reviewed prior to research being conducted.”<sup>1</sup> A registered report is an “emerging genre of a research article that operates in a hybrid state, first serving the function of a registered protocol (Stage 1) and then, later, serving the function of a full empirical article (Stage 2)”. (Mehlenbacher, 2019a: 40). Such registered reports are useful to avoid the dubious practices of HARKing (hypothesizing after the results are known) (Rubin, 2017). Such different types of undisclosed post hoc hypothesizing could harm scientific progress and become a failed practice.

### 3.4 Peer review: Changing practices

In order to prevent questionable modern practices of publishing research, open peer review is an important perspective. “The recent transition from traditional subscription to open access publishing has increased the reviewing and publishing options of authors” (Barroga, 2020), providing them multiple opportunities of a pre-peer review commenting, pre-publication peer review, post-publication peer review, post-publication commenting, collaborative review, portable review, recommended services review, and decoupled post-publication review. These opportunities suggest external companies (e.g. *Rubriq* and *Peerage of Science*) that provide independent peer review, sometimes pre-submission one, for a fee. Such a changing strategy of a peer review responds to the current situation that happens in many journals. Peer review plays a significant role in the modern publication process, but it is “still far from being perfect and suffers from bias, lack of transparency, rational cheating, plagiarism, professional jealousy, hidden conflict of interest, fake peer reviewers, and false reports” (Barroga, 2020).

<sup>1</sup> Royal Society Open Science. Registered Reports (2018). Retrieved from <https://royalsocietypublishing.org/rsos/registered-reports>

**Table 1.** Open Science in the Process of Research  
**Таблица 1.** Открытая наука в исследовательском процессе

Stage	Practice	Resources	Genres
The choice of topic, search for funding	Peer review	<a href="http://www.experiment.com">www.experiment.com</a> <a href="http://www.kickstarter.com">www.kickstarter.com</a> <a href="http://www.scistarter.com">www.scistarter.com</a>	Crowdfunding grant proposal with the use of multimedia technologies
Data Gathering	Collaborative	<a href="http://www.labguru.com">www.labguru.com</a>	Collaborative lab reports and lab notebooks
Data Analysis	Artificial Intelligence (AI), Data Mining	Intellectual systems of data analysis	Registered reports

Not only competent and trained peer reviewers can participate in reviewing and assessing scientific works. Open peer review is held in the activity of preprints. A preprint is a “piece of research that has not yet been peer reviewed and published in a journal.”<sup>2</sup> National Institutes of Health have claimed the preprint to be a common form of Interim Research Products and defined it as “a complete and public draft of a scientific document”.<sup>3</sup> A well-known repository is <https://arxiv.org/>: interestingly enough, it was the first to present the model of open access in 1991. There is no official reviewing process there, but reviewing still exists, though it takes the formats of the explicit moderation of the article that consists of several stages, the most important factor being the interest for readers. These preprint servers are meant to include a feedback from reviewers, editors, or comments, both public and private.

However, peer reviewing in preprint servers has a downside. In June 2020, there was “the biggest research scandal of the pandemic so far” when two high-impact medical journals *The Lancet* and the *New England*

*Journal of Medicine* each retracted a high-profile study of COVID-19 patients. Sapan Desai, an American vascular surgeon and owner of Surgisphere, published that COVID-19 patients on hydroxychloroquine had “a significantly higher sign of death”. Instead, the preprint claimed that ivermectin was found to be an effective drug. Although the articles published in the *NEJM* and the *Lancet* journals were retracted, 52.5% of recent articles were still citing the preprints and those two retracted articles (Piller, 2021).

In the process of research, peer review is an essential and traditional tool and practice that guarantees the necessary quality of a publication; however, multiple cases of HARKing and questionable research practices that were getting to be more common in the COVID time called for reconsidering the practices of peer review towards open, fast, and independent ones.

### 3.5 Remediation of traditional print genre of a journal article in the Open Science Age

Steven Darian has illustrated the significance of visuals by functions: explanation, understanding, remembering, elaboration, economy, summarizing, reasoning/analysis/exploration/discovery, problem-solving, argument/persuasion (Darian, 2003). The digital technologies have expanded non-linear texts, such as charts, diagrams, figures,

<sup>2</sup> See Preprints.org., retrieved from [https://www.preprints.org/how\\_it\\_works](https://www.preprints.org/how_it_works)

<sup>3</sup> See The website of the National Institutes of Health, retrieved from [https://grants.nih.gov/grants/policy/nihgps/html5/section\\_8/8.2.5\\_interim\\_research\\_products.htm](https://grants.nih.gov/grants/policy/nihgps/html5/section_8/8.2.5_interim_research_products.htm)

graphs, hyperlinks. As traditional research genres are remediated, i.e. moved from page to screen, from alphabetical to image-based writing, the language of visuals is used across genres and disciplines, while actively engaging in the meaning-making process.

With the development of the Open Science practices, the traditional print research article has acquired “some add-on genres, which can be explained by its genre affordances or a new communication setting” (Giltrow & Stein, 2009: 9). Gross and Harmon claimed that “the Internet has reinvented the scientific article and related communication, thus affording new possibilities to integrate written and visual communications” (Gross & Harmon, 2014: 267). An article has gained its own add-on genres, the feature to be tightly connected both with the generic affordances and practices to make the article visible and read.

The most promotional subgenre of research writing is arguably an abstract. This very genre has acquired several changes, related to multimodality. Thus, abstracts are divided into graphical or visual abstracts as well as video ones. Journals more often request the submission of a graphical abstract, also known as a visual one, as a single, visual summary of the main findings of the article. It could be a figure from the article or a figure that is designed for the purpose of clarifying the content and sharing your work in an accessible and memorable manner. The graphical abstracts are displayed in online search result lists, the online contents list, and the article on Science Direct and mainly found in chemistry, biology, and medical journals. According to the statistics, “a visual abstract is shared eight times more on social media than a text-only summary, resulting in three times more visits of the article on the journal website” (West et al., 2020: 2103). Another way to clarify the content of an article is to use the motion picture, usually not longer than five minutes, known as a video abstract. The first video abstract has been a Cell Press video posted in May 2009, that’s garnered more than 11,000 views (Berkowitz, 2013). Since

then, the list of publishers accepting video abstracts has been expanded – ACS Publications, Elsevier, IOP Science, Taylor and Francis, Wiley. Both graphical abstracts and video abstracts are led by the incentive to popularize the research and immediately serves as an example of a multimodal text.

Along with the multimodality, we have one more trend towards popularization of the research – catering the needs of a different audience of non-experts. The abstract for specialized readers coexists with the abstract for general audience (lay summary), the main task of which is to explain the most important terms. Other options are the highlights: highlights are “three to five (three to four for Cell Press articles) bullet points that help increase the discoverability of your article via search engines.”<sup>4</sup>

Open Science encourages the reproducibility of results, which is one of the reasons why methods articles are gaining more and more popularity, especially in the video format. There is a video journal called JoVE (Journal of Video Experiments) that publishes the articles in video format. Born ten years ago, “JoVE remains the first and only peer-reviewed scientific video journal, publishing more than 100 new videos each month.”<sup>5</sup> Among the fields of research are both life sciences and engineering, genetics and medicine.

The dissemination of knowledge should be fast, and that has become a reason for the proliferation of short articles with fast turnaround period. Those short texts are called letters, reports that deal with the core of your experiment. The need to communicate with your audience in the context of participatory culture is realized in the communications, perspectives, comments, replies, i.e., genres that provide a clear-cut standpoint of the author together with the reader’s feedback.

To wrap up, a traditional research article acquired many features of multimodality

<sup>4</sup> Elsevier: Author tools and resources, retrieved from <https://www.elsevier.com/authors/tools-and-resources/highlights>

<sup>5</sup> JoVE journal: Overview, retrieved from <https://www.jove.com/about>

in the participatory culture. The “add-on” genres are to attract multiple audiences in order to popularize the research and make it more visible (graphical abstracts, lay summaries, highlights). “Show, don’t tell” motto is manifested in video abstracts and video articles while digitality has penetrated into each and every article with the language of visuals to be essential across genres and disciplines.

Second, the participatory culture and the growth of manuscripts submitted every year dictated the need for the fast turnaround period, which paved the way to a short article, such as a research letter. The urge for reproducibility of results dictated the popularity of the methods articles, which has made research results to be transparent.

### 3.6 Promotional genres of science communication

Science communication is not limited to writing journal articles and staying in touch with the editors and peer reviewers. The results of the research are reported at various domestic and international conferences, while conference presentations and writing-based genres of a conference abstract and conference paper are getting to be a necessary and important career achievement. Since in the COVID era many scientific events have moved online, we can name these genres digital. As the genre set “conference abstract” – “conference paper” – “conference presentation” is getting to be an essential bonus in the scientist’s career; thus, we would name them promotional genres.

These genres are hybrid as they combine features of written academic discourse and oral discourse. The same is true about one more influential genre of science communication – a research grant proposal. A traditional grant proposal is an essential step towards career growth and often predetermines the choice of the field/topic of research for early-career researchers. It is also a set of genres that fulfil the needs of an existing professional research practice – a business card, a CV, an extended synopsis, an abstract, a research proposal. These text documents are interdiscursive as they share the features of scientific

discourse, business correspondence, and narrative practices, accommodating the content of the applicant’s scientific research to diversified audiences of experts across disciplines.

Promotional written genres are peer reviewed and are meant for experts with different scientific background. In contrast, presentational and trans-scientific genres cater the interests of wide audiences. Therefore, we have classified them into two separate types.

### 3.7 Trans-scientific genres in the Open Science Age

Trans-scientific genres are defined by A. Mehlenbacher as “the forms that exist somewhere between professional and popular discourses about science” (Mehlenbacher, 2019b: 2). Among these trans-scientific genres are crowdfunding proposals, blogs, databases, digital news reports, to name just a few. According to A. Mehlenbacher, these text genres hold an intermediary position between research-based genres and popularizations. Those are the genres that form “the conversational model of science communication.” (Mehlenbacher, 2019b: 11).

Such text genres share common characteristics of diverse discourses – the feature called hybrid interdiscursivity, which belongs to the most innovational features of Critical Genre Analysis (Bhatia, 2016: 62). Such a mixing of different texts (intertextuality) and discourses (interdiscursivity) is common for the electronic journals and an online news article “followed by posting of reader comments”, which Ian Bruce has called “a participatory news article” (Bruce, 2010: 323). Electronic journals are gaining more and more popularity in the “convergence culture” (Jenkins, 2006) – the culture where old and new media collide. It is accompanied by “participatory culture” – the term that “contrasts with older notions of passive media spectatorship” (Jenkins, 2006: 3). A combination of a blog and a forum is “The New Reddit Journal of Science”. It has a special forum “Ask Me Anything” in which people who have become successful in quite diverse fields of science, art, and politics give answers to the questions of general public. Among those people are an

outstanding astrophysicist and cosmologist Neil de Grasse Tyson, a businessman, engineer and the owner of companies SpaceX and Tesla Motors Elon Musk, and Buzz Aldrin, one of the first people who walked on the moon together with the flight commander Neil Armstrong in 1969.

A more science-related product of the participatory culture is the website <https://theconversation.com/global>; it provides the viewers a similar opportunity to post comments and participate in a discussion of the scientific research news. The dialogue between academics and journalists is going on in a “research-based news and analysis that is an example of high-quality explanatory journalism”<sup>6</sup>

In many cases, a recently published research article has become a source for recontextualization of the new media. The “convergence factor” is more telling in press releases and science news reports posted on science journalism websites, such as *Science Daily*, *Phys.org*, *EurekAlert!* All these websites use the multimodal resources, such as video and audio podcasts, images, and are a constituent part of social media.

Although blogs are considered to be the first digitally “native” genres, there are other genres that were born digital. One of such genres is TED talks. “TED talk videos are seen as digitally mediated scientific popularization practices”. (Xia & Hafner, 2021: 36), which main function is not only to inform the diversified audience but also to engage it. As the above-mentioned genres, Ted talks are located “at the interface between university lectures, scientific communication, newspaper articles, conference presentations and TV science programs.” (Caliendo, 2014: 113).

Trans-scientific genres are diversified formats of science popularization. They are the Internet-born genres that disseminate and promote knowledge from various sources and at the same time seek the feedback of the audience; thus, these genres are hybrid interdis-

ursive as they share the features of a blog and a forum or a news report and a forum. Paraphrasing the words of M. J. Luzon, science blogs, science news reports, Ted talk science popularizations videos “open space for science communication, where a diverse audience (with different degrees of expertise) may have access to science information intended both for non-specialist readers and for experts” (Luzon, 2013: 428).

### 3.8 Presentational genres of science communication

Multimodal elements are involved in the presentational genres, which also serve as practices of scientific popularisation. Popularizing is not merely adaptation of the content, but rather its recontextualization from a more specialized context to a less specialized one (Carter-Thomas & Rowley-Jolivet, 2020). A perfect example of such a recontextualization practice is three-minute thesis presentations (3M T), a popular academic genre that “captures a competitive and high-pressure atmosphere of the modern academy” (Hyland & Zou, 2021). Participants have to talk about their research, addressing diversified audiences, and are “restricted to spoken words and can display only one static slide (animations, music and electronic media are not permitted)” (Qiu & Jiang, 2021: 2). There is a clearly seen discursive hybridity of this academic genre. As a part of the spoken discourse, 3M T clearly have lots in common with orally performed academic genres, such as conference presentations. Unlike conference presentations, however, the participants address a diversified general educated audience. From this perspective, they use the scientific terms and concepts in accessible manner. Thus, the genre is close to another popular “infotainment” or “scifotainment” (Perez-Llantada, 2021), such as TED talks.

A good example of a presentational genre is Fame Lab, 3 M T on STEM subjects, the contest that implies the participation of the early-career researchers administered by Cheltenham Science Festival together with the British Council. The judges are scoring the presentations in accordance with three cri-

<sup>6</sup> The Conversation: Academic rigour, journalistic flair, retrieved from <https://theconversation.com/global>

teria: content, clarity, charisma. At the same time, the comments from the Internet viewers are also allowed. Thus, Fame Lab presentations also share the features of a presentation and a forum.

Interestingly, quite a conservative academic genre as a lecture has also gone online. The COVID era has contributed to the proliferation of these popularization practices that exploit various multimodal resources, such as static elements and animated images. Improving online video lectures has become one of the goals for media specialists and language professionals (Lange & Costley, 2020).

All in all, this section considers the peripheral genres that are secondary and depend on research genres, on the one hand, and on the oral discourse, on the other hand. This hybridity is manifested in the presentation that lies at the intersection of two modes and can cater the needs of various audiences.

#### 4. Discussion

The article addresses the genres and the problem of their classification from the functional perspective. The text genres are set in the context of digital environment that was formed in the Open Science age. The Digital Revolution managed to rethink the concept “writing”, which is nowadays “both alphabetic and image-based” (Kress, 2003: 73). Therefore, all the genres have digital affordances and obtain multimodality features, which are getting to be essential in each and every text genre.

The social uptake on genre allows us to consider a genre as a tool for reaching a certain scientific or public goal and multiple audiences. If the purpose of the writer is to disseminate the results of his experiment to the expert audience, the choice is a research article, published in the context of e-journals with the practices of open peer review. Conference genres, both written and oral-based, should fit the conventions and the format of the conference event and address experts across disciplines.

On the other hand, participatory culture of the Internet environment calls for the engagement of practice of trans-scientific gen-

res. Hybridity is more prominent in electronic science popular journals that often share the features of a blog and a forum. The hybridity is in most cases interdiscursive. In news reports, the scientific discourse and PR discourse are combined.

In the conversational model of science popularizations, presentations play an important role. In academic settings, the genre that is taught quite extensively is called a three-minute thesis presentation.

The classification of genres gives food for thought and further debate. The borderline between one group of genres and another one is often blurred. W. Yang has called an emerging genre of three-minute theses to be “promotional” (Yang, 2020). Ashley Mehlenbacher has included crowdfunding proposals as related to trans-scientific genres (Mehlenbacher, 2019b). The difficulty of the classification is one more factor in favor of the complexity of genres in the modern social context of the digital environment. We consider the variety of genres to be important for genre scholars, teachers of academic writing, early-career researchers. Digital academic culture and the “digital scholar” (Weller, 2011) is impossible without developing the genre awareness and critical literacy.

#### 5. Conclusions

Open science seems to affect all the fields of knowledge production, knowledge processing (communication), distribution of knowledge (publishing), and institutional environment (e.g. social network sites – Academia.edu, Research Gate). The article seeks to focus on the problem of genres and genre classification, but inevitably has to address the mechanisms of knowledge production and processing.

The participatory culture of the Open Science age contributes to blurring boundaries of experts and non-experts in the Internet space. However, Open Science is not only about knowledge “translation”, making the research to be more accessible in the dialogue with different audiences. It is also about the changing mechanisms of expert science, with its “open notebook” approach where every-

thing is posted online – from successful outcomes to the discussions of papers and even failed attempts. Such a visibility makes science not only accessible for data sharing but also expert-like, thus making science not only a great tool, but a great risk.

In sum, digitality has largely changed the concept “science” with its hybridity in both genres and practices, where expert science with its openness and visibility competes with popular science with its content accommodation to cater the needs of different groups with different interests.

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