

Article

# Alive Publication

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**Abstract:** An alive publication is a new genre for presenting the results of scientific research, where the scientific work is published online, and then is constantly being developed and improved by its author. Serious errors and typos are no longer fatal, nor do they haunt the author for the rest of his or her life. The reader of an alive publication knows that the author is constantly monitoring changes occurring in this branch of science. Alive publication faces the inertia of scientific publishing traditions and, in particular, traditional bibliometrics. Unfortunately, at present, the author who supports an alive publication is dramatically losing out on many generally accepted bibliometric indicators. The alive publication encourages the development of the bibliography apparatus. Each bibliographic reference will soon have to contain on-the-fly attributes such as attendance, number of external links, date of the last revision, etc. In the opinion of the writer of these lines, as the alive publication spreads over to the scientific world, the author's concern for the publication's evolution will become like a parent's care for the development of a child. The Internet will be filled with scientific publications that do not lose their relevance with time.

**Keywords:** scientific publication; dynamic content; article versions; last updated date

## 1. Introduction

An alive publication is a scientific work that is published on the Internet that is constantly being developed and improved by its author. This genre of scientific publication has a number of obvious advantages, including:

- An author who has abandoned traditional static publication in favor of alive publication find themselves in a new, much more comfortable, and productive environment. Serious errors and typos are no longer fatal, nor do they haunt the author for the rest of his or her life. The circle of readers of an alive publication is also much wider. Interest in the publication often increases over time, with many readers returning to their favorite text, not only to refresh their memory of the most significant moments, but also to learn how the author's views have transformed and what new trends the author has noticed in the area under consideration.
- For the reader, an alive publication is undoubtedly preferable to a static one. Readers feel much more confident when they know that the text in front of their eyes is under the constant control of the author, who has carefully corrected all the errors and inaccuracies noticed since the first publication of the work online and is constantly monitoring changes occurring in this branch of science.

The following is a typical example of the advantage of alive publishing. In 2016, the last volumes of the Great Russian Encyclopedia (GRE) [1] were published, and the GRE was posted for open access online. In 2018, the GRE site traffic was 90 thousand hits per month. The traffic to the Russian-language Wikipedia [2] in the same period was 900 million hits per month. Thus, for one appeal to a static GRE that quickly goes out of date, there were 10 thousand requests to the alive Wikipedia. Of course, "static/alive" is not the only difference between the GRE and Wikipedia. Yet such dissimilar traffic figures seem to be primarily due to this difference.



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However, an alive publication only partially resembles a Wikipedia article. The main difference is that in Wikipedia, all members of the wiki community edit the article and maintain the relevance of its content, but no one is personally responsible for the article. Therefore, Wikipedia is often forced to put up with the existence of articles that have been forgotten by the authors, where the relevance of which has long passed.

In contrast, the author's name of an alive publication is explicitly placed next to the title. The author is the sole owner of the alive publication: he, and only he, has the right to make changes to it at any time. An author, who declares that his or her publication is alive, assume the responsibility not only to constantly improve it, but also to monitor for developments in the research area, and systematically reflect everything new in the text under consideration.

The use of the term "alive" publication is not conventional practice. The terms "living" [3,4], "evolving" [5], "dynamic" [6], "liquid" [7], "propelled", "movable", "progressing", "developing", and "advancing" are used more often. To our regret, most of these terms generally mean that the publication contains multimedia and/or interactivity rather than alive content.

As can be seen from the above bibliographic references, alive publications appeared quite a long time ago. However, the terminology in this area is not yet well established. This work is an attempt to systematize the concepts from the area of alive publications. In addition, the environment in which the authors and the readers now exist need to be improved. Some software tools are offered to service alive publications.

## 2. Status

The attitude towards alive publications is, as of yet, ambiguous. Recent fundamental reviews [8,9] of the prospective models of a journal article do not even mention alive publication. Nevertheless, the project "Wikiversity: Journal of the future" placed alive publication in the first principal position among the main features of the Journal of the future:

*Research is a process. The scientific journal of the future provides a platform for continuous and rapid publishing of workflows and other information pertaining to a research project, and for updating any such content by its original authors or collaboratively by relevant communities. Eventually, all scientific records should have a public version history or a public justification for not having one [10].*

The English version of Wikipedia does not have an article entirely dedicated to alive publications, however, in the Russian version of Wikipedia, such an article is present [11].

The life of an alive publication begins when the author posts it for the first time in an institutional archive, on a preprint server, or in another online repository. The main point is that this repository does not limit the number of subsequent revisions to the stored publication.

Along with the development of the content, other next steps are also possible. In particular, the author then thinks about the status of this alive publication.

The status of a scientific article is largely determined by obtaining the approval of the reviewers of a reputable journal. Therefore, the author of an alive publication usually sends one of the versions of the text to a journal. An alive publication feels most comfortable in an overlay journal [12], where the full text of the article is posted in a repository independent of the journal. The repository usually supports content elaboration and development. Subsequently, the alive text posted online is supplemented with a link to the journal. This link serves as a guide for the online reader in terms of the article quality.

The reader of the subsequent versions, of course, is aware that the journal reviewed an earlier version of the text, which may have been preserved somewhere in the protocols but is no longer of interest. However, the mention of a journal publication usually looks like a reliable sign of quality in the eyes of the reader. It seems unlikely that the author wrote a good-quality article, went through the thorns of peer-review in the journal, but then worsened the quality of the text as a result of the subsequent editing. At the same time,

of course, it is necessary to give the reader the opportunity to choose between a proven, but outdated journal publication and a fresh, but less reliable version of an alive publication.

The connection between an alive publication and an overlay journal is built very organically. The overlay journal does not print or copy the full text of an alive publication to its site but will place a link to the publication's position in the source repository. It is desirable for the overlay journal, in turn, to be alive. In such a case, the information, abstract, review, or illustration included in the overlay journal evolve along with the evolution of the alive publication. The union with the alive overlay journal is not broken, even when an alive article gradually transforms into an alive monograph, as there is an increasing depth and volume of the alive content.

Certain difficulties arise in the administrative bibliometric evaluation [13] of an alive publication. In particular, it is not clear what should be specified as the year of publication in this case. Alive publications are often supported over many years, taking up a significant part of the author's working time. For example, the writer of these lines posted online in 2007 and still supports the alive publication [14]. During this time, the text has been changed hundreds of times. Traffic is growing every year; now about 50 readers visit this alive publication every day. Based on the materials of the alive publication, two journal articles have been published. But, of course, a lot more time and effort has been spent on continuously maintaining the actual versions of the alive publication than on the two ordinary publications. Therefore, when answering the question about the number of publications in recent years in a questionnaire, the author may be at a notable loss.

The authors of alive publications often lose out to their colleagues with regards to traditional bibliometric indicators because instead of writing several publications, they are engaged in improving only one. There may be many links to an alive publication, however, there are not many alive publications themselves, which is why, for example, their Hirsch index (h-index) can decrease significantly.

However, some bibliometric indicators present an alive publication in a favorable light. For example, a well-known altmetric is the number of bookmarks saved by the site visitors. Visitors to a traditional publication save bookmarks for well-known reasons, including to refer to the publication in their own work, or to reread it if something is forgotten. In an alive publication, an impressive addition to these reasons is the reader's interest in the author's new results and in the recent developments in the field under consideration, reflected in the alive publication.

So far, unfortunately, using the number of bookmarks as a full-fledged altmetric is not recommended. A reference management system can count bookmarks, however, there are too many similar systems, such as Mendeley [15], EndNote [16], Zotero [17], and others. In fact, Wikipedia [18] counts approximately 30 such systems. A single bookmark counter for all systems has not yet been implemented, so this interesting altmetric is used infrequently.

### 3. New Genre

Let us consider a few typical features of the genre of alive publication.

An author who has published a traditional static article and then received a new result in the same field is forced to prepare an additional article. Like any other article, the additional article must be self-contained, therefore, a significant part of it must be allocated to repeating the conclusions obtained in the original article. This leads to a need to duplicate texts, which interferes with the reader who is already familiar with the initial article. In addition, because of this inevitable duplication, the author may be reproached for self-plagiarism [19]. The authors of the alive publication is spared from these troubles because they do not duplicate anything, but simply add new results to the existing alive text.

At different times, an alive publication may receive reviews from competent experts. The number of reviews is unlimited. The author, of course, reflects the reviewers' considerations in the alive text every time. Thus, the reviewers become, to some extent, a co-author of the publication.

An alive publication can be accompanied by a blog where everyone can express their opinion on it. The author actively participates in this discussion and constantly reflects the discussion results in the alive text. Here, the evolution of the alive publication begins to resemble crowdsourcing.

Technically, working in the alive publication genre is easy. Many scientists have already mastered these skills by keeping their personal web page or profile up to date. Here, the scientist must constantly update their scientific biography and main results. If a personal web page includes the professional credo, then the continuous reflection of its evolution is essentially an alive publication.

It would be useful to convert the many types of scientific works into the genre of alive publication. For example, it makes sense to make corrections to the online text of a thesis after the defense to reflect the views expressed during the discussion. Then, for several years, the new Philosophiæ Doctor could keep this text up to date, reflecting both the author's new results and changes occurring in the research area. Of course, the original text of the thesis discussed during the defense must also be stored and available.

Each major research center in a specific area could initiate the creation, and regular maintenance, of an alive specialized encyclopedia. This task is both vital and honorable. Compiling a vocabulary and allocating the responsibilities for maintaining articles between individual specialists is performed in cooperation with the related scientific organizations. The main point is that all the authors of an individual article consider it their most important duty to constantly maintain the up-to-date text, reflecting the evolution of the scientific field.

The appearance of alive publications has significantly transformed many of the usual connections in the infrastructure of scientific publications. For example, in a traditional publication, all the elements of the bibliographic list were published before it was published, and all the articles that quote it are published after it was published. In contrast, an alive publication often refers to an article published after the first appearance of this alive publication. In addition, an article quoting an alive publication may come out long before the current version of the alive publication appears. Thus, the existing bibliometric indicators require a certain correction.

#### 4. Immortality

What happens to an alive publication when the author, for some reason, loses the ability to systematically keep it up to date?

An alive publication can be, for example, an article in an alive specialized encyclopedia. The care of such an alive publication was probably entrusted to the author by a research center that maintains this alive encyclopedia on its website. If the author is now out of the game, the research center must find a successor to the author who will inherit the responsibilities for this publication.

If you, as the author of an alive publication, were maintaining it on your own initiative, then you certainly have the right to bequeath its subsequent updating to someone. In this case, the publication does not just continue to exist but also retains its "alive" status. If you do not have a successor, the future fate of this alive publication seems to be no different from that of any other publication published on the Internet.

Of course, it is necessary to think about safety. In 2013, the G8 Science Ministers published a corresponding statement:

*We recognize that the long-term preservation of the increasingly digitized body of scientific publications and data requires careful consideration at the national and international levels to ensure that the scientific results of our time will be available also to future generations [20].*

As long as an alive publication is truly alive, backing it up requires special attention. The point is that when a modification is made to an alive publication, the same change should be made to the backup copy simultaneously. If the publication becomes static, it is copied as usual.

In the WebCite [21] and Perma.cc [22] projects, an interesting approach is suggested in which the care for the backup of an online publication is assigned not to its owner but to the author of the work that links to this publication. Before posting a hyperlink to someone's article, publishers who follow this approach copy this article to the reserving repository. The hyperlink, in this case, contains two addresses: the direct address of the publication and the reserved address of its copy in the repository. Unfortunately, these projects do not serve alive publications since such copies of alive articles do not track their changes.

Also, of course, it is necessary to ensure that when the publication address is changed (which often happens when the site is reorganized), external links are not affected. The DOI (digital object identifier) will help here. The publication can be assigned a unique number that replaces the explicit URL when linking to it. The URL that indicates where the publication is currently located is mapped to the number in the DOI project table. If the publication address changes, then the URL is changed in the DOI table, and all the links to the publication are correct again.

For a long time, an alive publication could not access DOI services. The main DOI registrar for scientific publications is Crossref. Alive publication and Crossref were incompatible since Crossref required strict immutability of the object that received the DOI. However, the number of alive publications steadily increased, and a few years ago, the requirement for the total invariability of a publication that received a DOI was removed.

Unfortunately, most of the leading scientific journals did not notice the removal of the total invariability requirement. To this day, they do not allow changes to be made to the online version of an article, even to correct an error that was noticed [23]. This is simply outrageous. Fixing an error in the online version requires a few minutes of work, and then all subsequent online readers would be able to read the correct text. It is absurd to extend ideas about the immutability of a printed article to the Internet.

## 5. Support for Changes

As noted above, publishers are dominated by a centuries-old tradition of paper publications, where the published text was perceived as a once-and-for-all formed monolith that resolutely does not allow any alterations. In particular, the existing mechanisms of the bibliographic references, citations, and many other connections commonly used in the world of science are guided by the idea that any publication is written in stone. This largely explains the unnatural order for the Internet, according to which the vast majority of the scientific journals that post published articles online do not allow their authors to change anything later.

Indeed, if we allow published texts to change, we must transform some of the established views. For example, if the special means of servicing alive publications is not provided, a fragment of the text quoted by someone from outside may change or disappear altogether, or previously expressed criticisms of the work may hang in the air because the author of the alive publication has improved or corrected its text.

In [24], a fundamental approach is proposed to ensure that the reference to an alive publication is correct. If an article referring to an alive publication is itself assumed to be an alive article, then it is possible to avoid the disagreement of this reference when making changes using a specific tool. The link to an alive publication is encoded in a special way, thus, when the cited material changes, all the authors of the works that make reference to it receive notifications, where their references are marked as possibly outdated. In response to this notification, the reference author analyses the changes that have occurred and perhaps correct the link, making this reference relevant again.

Special consideration should be given to the peer review of an alive publication. Is it possible to mobilize a reviewer who will promptly monitor every change made by the author of the publication and allow, or not allow its appearance on the official website of the publication? This would probably be too difficult and time-consuming.

The problem is easily solved if the publisher implements the simultaneous existence of two versions of the publication on the site: the official version that has passed peer review

and the author's version, which has not yet been approved by the reviewer. Then, the decision is up to the site's visitors, allowing them to choose which version they would like to see.

The status of the author's version here becomes similar to the status of a site visitor's comment on the online work. The editorial board can pre-moderate both comments and changes and can block extremist statements, but the board is not responsible for their quality or content. Of course, at the request of the author, the editorial board can conduct one more peer review when transferring the author's version to official status. However, the author should not abuse such an opportunity. For example, in the Ridero publishing house [25], changes introduced to an alive print-on-demand book are checked and recorded no more than once a quarter. The arXiv provides the author more freedom: "We ask that articles be replaced no more than once per week" [26].

## 6. Versions

A popular and reliable support scheme assumes that changes made by the author to an alive publication are always logged in the form of versions (generations, revisions). In this case, in particular, criticisms concerning the previous state of the material corrected later do not lose their meaning if they are addressed to an earlier version of the text that was saved in due time. The protocol of changes is useful for also providing related comments from the author, allowing the regular readers to easily track all the innovations that appear in the text.

The forms of version support of an alive publication are not yet well established. Let us consider typical solutions using the example of well-known systems.

Crossref is a DOI registration agency that has been running the version support service Crossmark [27] since 2012. According to Crossmark, the "Check for updates" button (Figure 1) is eye-catching and prominently displayed in an online document.



**Figure 1.** CrossMark button supporting versions of a publication in Crossref.

By clicking on this button, the reader can determine whether a more recent version of the material exists, where it is located, and whether this material has been retracted by the editor.

F1000Research [28] is an open-access publishing platform. In F1000Research, when you encounter an early publication text that already has an updated version, the first thing you see is a message in a pop-up modal window that states that this version is outdated, and that there is an opportunity to read the more recent text. Of course, the vast majority of visitors who see such a message will go to the updated text, where at least the errors noticed will have been corrected. The F1000Research scheme seems more practical than the Crossref scheme, where a web page visitor may simply not notice the "Check for updates" button and may therefore read the outdated text.

However, both the Crossref scheme and the F1000Research scheme have drawbacks. When forming a bibliographic reference, the obsolete version of the text should not be abused. An out-of-date version is generally not interesting to ordinary visitors. It may be important only to a historian of science or a lawyer who proves the precedence of an author. For the mass reader, it is much more comfortable to immediately access the latest version of an alive publication. It is only a rare fan of antiquities who may be interested in the history. For this enthusiast you can provide a special button, "Protocol of changes".

The electronic arXiv [29] overlay journal Sigma [30] supports alive publications and refers primarily to the latest version of an alive article. If the author wants to make changes

to an already published article, the journal publishes a new version of the article on its website and replaces the article in the arXiv. In the case of minor changes (when referees are not needed), the journal makes them quite quickly (within a few days). The previous version also continues to be stored and is assigned the same name with the addition of the suffix v<i>, where <i> is the version number. This means that the suffix can be used to refer to any version, as well as to the latest version, without the suffix. However, in Sigma, you cannot refer to the latest version with the suffix, which makes naming somewhat difficult.

The last drawback is missing from the version naming scheme used in arXiv. Here, the recent version has both a short name without the suffix and a name with the recent version number suffix. This scheme allows you to refer both to the alive publication as a whole and to any specific version of it, including the recent one. In 2022, publications in arXiv received a DOI. The DOI is the same for all versions of an alive publication and always refers to the most recent one.

However, due to the imperfections of the current publication infrastructure, certain conflicts arise here as well.

For example, the third version of an article placed in arXiv [31] was published in 2018 in the traditional non-overlay journal “Classical and Quantum Gravity” [32]. A year later, the authors had placed a new fourth version of the article in arXiv (Figure 2). When publishing the third version of the article, the journal assigned the article a DOI and placed the Crossmark icon (Figure 1) on its web page. However, the traditional journal does not support alive publications, pretending that it knows nothing about the existence of the arXiv. Therefore, the journal did not reflect the appearance of the new fourth arXiv version in Crossref. As a result, the Crossmark icon confuses online readers of the third version of the article published in the journal by mistakenly informing them that a more recent version did not exist.

Journal reference: [Class. Quantum Grav. 35 065010 \(2018\)](#)

DOI: [10.1088/1361-6382/aaaafa](#)

Cite as: [arXiv:1710.02185 \[gr-qc\]](#)  
(or [arXiv:1710.02185v4 \[gr-qc\]](#) for this version)

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### Submission history

From: LVC Publications [[view email](#)] [[via Lvc Publications as proxy](#)]

[v1] Thu, 5 Oct 2017 19:18:51 UTC (4,609 KB)

[v2] Wed, 11 Oct 2017 16:26:26 UTC (4,608 KB)

[v3] Tue, 7 Nov 2017 22:45:22 UTC (4,608 KB)

[v4] Tue, 8 Oct 2019 13:29:33 UTC (4,507 KB)

**Figure 2.** Four versions of a publication on arXiv [31].

This error is a characteristic consequence of the imperfections of the scientific publications’ existing infrastructure, which still do not always support alive publications.

## 7. Preprint: Morphological Misunderstanding

Nevertheless, version support services for alive publications have become widespread. For example, in 2019, such support was implemented even on the pirate site Sci-Hub [33]. Gradually, the understanding has developed that the life path of a modern scientific article is a long chain of links “several generations, optional journal publication, several generations, etc.”, with a journal publication being neither the main nor a mandatory link in this chain.

The alive publication is confidently moving towards a leading position. The fetishization of the publication of an article by a traditional journal is becoming a thing of the past [34,35]. Back in 2002–2003, Gregory Perelman published his famous proof of the Poincaré conjecture not in a journal but in the form of an alive publication in arXiv [36,37]. This did not prevent him from then proving his copyright and gaining worldwide recognition.

Currently, the actual printing of a publication may not happen, and a publication may well be limited to an online form. It is usually more convenient for readers to become acquainted with an article that interests them in an institutional repository or a preprint archive, rather than in a journal. Only in such environments can they confidently expect to obtain access to the latest version of the alive article. There is a growing understanding that the most organic representation of a scientific publication is a long series of generations. It is time to stop dividing these generations into the pejorative “before the journal” (preprint) and “after the journal”.

Publication in a journal is just an intermediate snapshot, an ordinary episode in the article’s rich biography. At the same time, the event of publication in a popular authoritative journal is the biggest source of comments, suggestions, and development. However, it is here, at the most fruitful moment, that the vast majority of publishers end the life of an article. This behavior of publishers is clearly not keeping with the interests of science.

To date, the most popular form of an alive publication is a preprint, however, morphology and semantics of the modern interpretation of the word “preprint” confuse everything. Part “pre-” here has long meant not only “pre-” (the preceding), but also the intermediate and subsequent. Part “print” in most cases is decisively replaced by “online”.

Preprints are becoming more widely distributed. In 2016, Crossref opened a dedicated preprint service [38]. In particular, Crossref membership was allowed for preprint servers, and custom metadata was implemented that reflects the author’s workflow from preprint to official publication and further.

Over the past few years, leading scientific journal publishers have opened preprint servers for their authors, including Springer [39], Elsevier [40], IEEE [41], MDPI [42], etc. [43]. Some of these servers accept preprints only before publication in the journal. However, most servers continue to accept new versions of the article after the journal publication in the same way, ensuring the parallel coexistence of the worlds of traditional journals and alive publications.

Unfortunately, the coexistence of a traditional journal and an alive publication cannot yet be called harmonious. While the servers of alive publications consider it their duty to place a link to an appearing journal publication, journals, by contrast, do not generally place links to subsequent versions of alive publications (Figure 2). The event of publication in a popular authoritative journal is a powerful source of comments, suggestions, and development. However, it is here, on the rise, that the vast majority of publishers cut the life of the article. The reader of the journal does not see the link to the latest version of the alive publication, issued in response to the new data. This kind of publisher behavior is clearly not in keeping with the interests of science.

The idea of the leading role of the journal is long gone. Two parallel spaces—alive preprints (more precisely, alive publications) and peer reviewed journal articles—now exist in equal rights. It remains only to manifest mutual respect. Not only is the preprint obliged to mention the appearance of a journal article on its basis, but the article is also obliged to inform the reader about the existence of the preprint, which was published later, and which strengthened the article.

The radical solution—to allow changes to the online text of the article on the site of the scientific journal—is practically not found yet. The only hopeful wording that came across on a journal's website was "Changes can be made to a paper published online only at the discretion of the Editorial Office".

A decisive change in the perception of role and status of preprints occurred in 2020 in connection with the COVID-19 pandemic. Here, the promptness of the preprint release brought this approach into a leading position. Among the countless number of scientific publications devoted to COVID-19, almost half came out in preprint form. MIT has created an overlay journal dedicated to COVID-19, which independently selects among the preprints and reviews the most important works on this topic.

## 8. Living Bibliographic Reference

With the transition of a scientific publication to online, it becomes possible to include some dynamic elements along with the traditional static printed content. Dynamism appears for two reasons. First, the publication may change, as we saw above, because the author decides to improve, correct, or update it. Second, certain elements included in the publication can be dynamic, changing automatically without the participation of the author under the influence of the embedded algorithms.

To emphasize the difference between these two sources of dynamism, we will continue to call the publication modified by the author "alive," but we will call an automatically modified element "living." In the future, we will need to apply a living element to serve an alive publication. Therefore, we now have to focus on the selected living elements in more detail.

There is a growing understanding that modern scientific publication is primarily an online publication. If, as a result, the online version of a publication begins to be perceived as the main version and the printed version only as an auxiliary version, then the world of scientific publications will become much richer and more attractive. Authors and publishers will no longer consider it their primary duty to serve the reader of the printed version of the work. They will agree that the printed version reader may be deprived of some of the acquisitions available to the reader of the online version. In particular, multimedia illustrations, direct access to databases, online calculations, etc., which are not available to the reader of the printed version, will become organic and natural elements of scientific publication.

There are only a few remaining modern printed publications that do not receive a full-fledged Internet projection. In contrast, there are more and more online scientific publications that no longer have any printed versions. Forms of online representation of scientific publications are constantly developing and improving. At the same time, many design elements currently used for online publications are outdated and are explained solely by the inertia of print publications.

In particular, the design of an online bibliographic reference is forced to be a servant of two masters, including WWW standards and print publishing standards. We must seek an interdisciplinary balance of their established traditions and interests. It is hard for print publishers to even start thinking in terms of pop-up hints, and the dynamic formation of a living text of a bibliographic reference requires excessive restructuring of their consciousness.

In addition, noticeable inertia has accumulated from the era of the formation of the Internet, when it was necessary to unrestrainedly save server calls, which led to poor online designs. The speed of information transfer on the Internet is constantly increasing, and it is time to make online bibliographic references richer, more informative, and more convenient for the reader.

The above-mentioned modern trend of the transition from the PDF to the HTML format, which opens up interesting new opportunities for developing the apparatus of a scientific article, is fruitful. The trend is quite powerful, but we cannot yet talk about a general transition to HTML. At the same time, if we look closely at how bibliographic

references are presented on the Internet, we will find that even if a publication, as a whole, is presented in PDF, its bibliographic list is often additionally duplicated in a HTML format as well.

There are various reasons, including that the PDF representation of a bibliographic reference is uncomfortable in terms of using copy and paste because extra line breaks appear in the copy. On the websites of many publishers, the full texts of the publications are available only for a fee, however, the bibliography as the main source of bibliometrics is usually available for free, and in this case, it is presented as an auxiliary file in a HTML format. Bibliographic references in the table of contents of an overlay journal [12] are usually presented in a HTML format since the date of birth of the last revision of the current publication is highly desirable here. The HTML format allows each bibliographic reference to be clearly and effectively supplemented with a living number of articles that link to it (Figure 3).



Article

**7**  
CITATIONS

**Parallel Algorithm of the NOISEtte Code for CFD and CAA Simulations**

A. Gorobets  
Journal: Lobachevskii Journal of Mathematics, 2018, Volume 39, Number 4, Page 524  
DOI: 10.1134/S1995080218040078

 [Read Online](#)

**Figure 3.** Bibliographic reference on the website of the Springer publishing house [44]. On the left is the living number of citations of the article.

Anyway, there are already many HTML representations of bibliographic references on the Internet. There is no doubt that they are the future. Therefore, in many cases, it makes sense to discuss improving an online bibliographic reference in the HTML without regard for its PDF representation.

One of the most attractive features of an online scientific publication is the use of hyperlinks, i.e., the ability to move from a bibliographic reference that interests the reader to the text of the scientific publication itself in just seconds. This feature is widely used, but its potential has not yet been fully revealed. The composition of the information included in the bibliographic reference needs to be supplemented and improved utilizing the data available through the hyperlinks.

The potential of a hyperlink allows the composition of the attributes included in the bibliographic reference to be modified, orienting it to the online reader rather than the editor, publisher, librarian, bibliometrist, historian of science, etc. All these professionals can find the information that they are interested in by clicking on the direct hyperlink to the online publication in question. At the same time, readers do not want to be forced to click on this hyperlink every time. They would like to get more useful information at an earlier stage. It is desirable that just by looking at the text of a bibliographic reference, they will be able to make an informed decision—does it make sense to click on this hyperlink?

For example, readers are not interested in such traditional bibliographic components as the volume number and issue number of the journal, or the range of page numbers of the article because they do not need to rummage through the library shelves and then turn the pages, whereas a hyperlink will lead them directly to the beginning of the publication of interest. At the same time, an important reference point may be the number of visits to this online article, i.e., an attribute that is not yet accepted as the significant component of a bibliographic reference.

The existing links in the modern Internet allow readers to dynamically, i.e., at the moment of the reader's request, build a list of "citing by," made up of the bibliographic records of the publications referencing this one. This opportunity is extremely useful because it constructively and clearly shows the direction of the research that is developing the provisions set out in the cited publication. This is a living list that has no counterpart in the world of static print publications.

At one time, it seemed that a reverse bibliography list could be constructed by explicit Trackback [45] or Pingback requests being shipped to an online publication from newly appearing referencing documents. The online publication that received such requests collected them and thus formed its reverse list. Unfortunately, this interesting mechanism was soon ruined by spammers, and today, it is practically not used.

However, the usefulness of the reverse bibliographic list is not in doubt. Therefore, the lists appeared, but they are implemented otherwise. Reverse lists are built by many bibliographic systems based on the data they collect about publications. Now Google Scholar, Crossref, Web of Science, etc., allow you to obtain a living reverse bibliographic list.

The inclusion of a reverse bibliographic list in the information section of any online publication has already become the norm for leading publishers. However, the bibliographic references in this list do not differ much from the traditional ones. Of course, the usual view of a bibliographic reference is convenient for the reader. However, you quickly get used to the good. Therefore, if the bibliographic references in the reverse list become more informative, as suggested below, then the online reader will be grateful.

Both reverse and direct online living bibliographic references, especially if they are located in an HTML file, open up new opportunities. The entire text of a bibliographic reference or some part of it can be generated based on the data available online and not written out explicitly. At first, you need to somehow get to an appropriate online representation of the publication. Then, you extract from this representation the meta-attributes of the publication and place them in the bibliographic reference generated by you. This decision eliminates the errors that inevitably occur, not only when directly rewriting text fragments but even when performing more reliable, but still objectionable, operations such as copy and paste. However, the most interesting thing here is that when the value of the publication attribute changes, the changed value also appears in the text of the bibliographic link to this publication.

The online representation can be either the source file itself, hosted in the primary repository, or other sources, such as Crossref meta-attributes, accessible via DOI of the publication. Increasingly, the information section of the source file includes links to the files in the formats BibTeX, RIS, EndNote, Medlars, RefWorks, etc., which are quite capacious sets of publication meta-attributes.

Although interaction via the Crossref API looks more respectable, there are many arguments in favor of the primary file. First of all, a document mentioned in the bibliographic list may not have a DOI. In addition, Crossref does not support some document attributes that are interesting to the reader, such as the number of visits. Finally, any attributes of the primary file are entirely in the author's hands, while expanding the composition of meta-attributes in Crossref would require considerable effort.

Now, a HTML, MS Word, and a PDF have simple tools for declaring arbitrary attributes. It could be possible to standardize the representation of all the meta-attributes that might be of interest to readers and place such attributes directly in the article file when creating or changing it. Whereupon the need to explicitly specify these meta-attributes in the text of the bibliographic reference in some cases completely disappears. The URL or, even better, the DOI is specified, and the appropriate API used to extract meta-attributes on-the-fly directly from the source file. Next, the extracted meta-attributes are combined in the HTML-text representation of the bibliographic reference in the desired manner.

As the experience of the well-known projects COinS [46], Dublin Core [47], etc. shows, direct placement of the meta-attributes in the source file is quite feasible and entails no difficulties for either the publisher or the traffic. It allows you to eliminate the duplication of

mostly identical meta-attributes when indexing a publication in bibliographic systems. The author will have the opportunity to correct inaccuracies or errors in the header information because corrections made in the source file will immediately be reflected in the text of all bibliographic references compiled in this way.

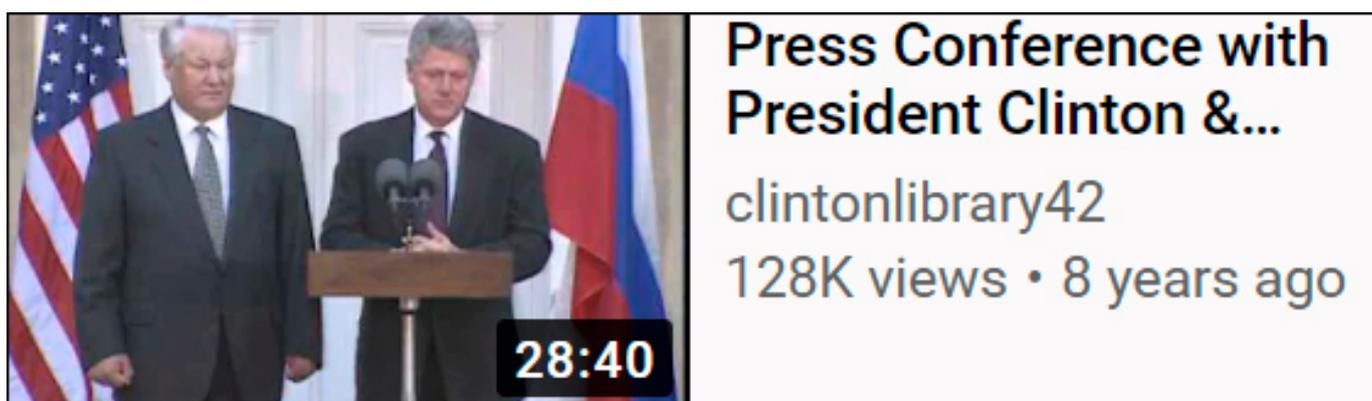
### 9. Living Cross-Domain Communications

At the same time, it would be unwise to limit yourself to the materials of the source file of the publication when forming a bibliographic reference online. It makes sense to supplement the traditional set of meta-attributes with various living data that are interesting for the reader. Such data, which can be obtained through cross-domain queries, are listed below.

- The first thing that can significantly help the online reader is to check the validity of the hyperlink provided in the bibliographic link to the online publication. After all, it is no secret that the original text of the hyperlink may contain an error, or the long-term safety of the material posted online may be in question. Such a check can be successfully performed by the robot, eliminating the confusion of the online reader who encountered a broken hyperlink. Based on the robot's check results, a "broken" hyperlink can be excluded from the text or marked accordingly.
- If there is no hyperlink in the bibliographic link, this, generally speaking, does not mean that the material is not available online. The link could have been forgotten, or the material was posted with a delay, and at the time of the preparation of this bibliographic reference, this material was still missing. To search for a hyperlink to an online posting of material, we can use, for example, the [48] service provided by Crossref. Adding the hyperlink found in this way to the bibliographic reference text will certainly please the online reader.
- The article that existed at the time that the bibliographic list was formed could subsequently be retracted by the journal's editorial board. The generator of bibliographic reference text can learn about the retraction, for example, from the corresponding Crossref attribute. A message about retraction included on-the-fly in the bibliographic reference will markedly save the online reader time.
- The number of visits for the entire period since the publication was posted, say for the last 30 days, is a useful [49] indicator that is not currently included in the online text of a bibliographic reference, likely because of the inertia of the printed publications. For example, YouTube, which is not constrained by print restrictions, shows the number of views in a prominent place in its concise online link to the video (Figure 4). The source of information about the visits (views) included in a bibliographic reference could be an analog of the project Counter [50], which would be turned not towards the publishers but towards the reader of the bibliographic reference. Another possible source is the meta-attribute "Number of successful resolutions for the month," generated by Crossref, but available now only in the monthly report [51] that Crossref sends to each publisher. However, Crossref recently complained about its generating statistics, as it does not always cope with the elimination of robot visits [52].
- The number of clicks (in total and/or in the last 30 days) on this bibliographic link from this online bibliographic list. Along with the publication's traffic specified above, this number of clicks can serve as a useful guide for the reader.
- Altmetrics—for example, the number of bookmarks for the publication made in the reference management systems (Mendeley, EndNote, Zotero, CiteULike, etc.)—is a useful indicator.
- The living number of external links to the publication according to Google Scholar, Crossref (Figure 3), Web of Science, etc., is another useful indicator. Instead of a living number of links, many publishers now supplement a bibliographic reference with static hyperlinks to records representing this publication in these bibliographic databases. By clicking on such a hyperlink, the reader will of course be able to find not only the number of external links but also much more information, including what

works have cited this publication according to the information from the bibliographic database. However, it is still better not to force readers to click on the hyperlinks unless it is critical, instead, the original bibliographic list should directly inform them about what is most interesting to them—about the living number of external links.

- Many publishers impose an open-access embargo at the beginning of a publication's existence, but after a certain period of time, the embargo is lifted. It is useful to inform readers dynamically about the current access mode directly in the bibliographic list. For a publication that has a DOI, this kind of verification is perfectly implemented in the Unpaywall project [53]. Further, if we find that access to the publication is not yet open, we can find out and offer the reader the address of the full text of this material on the popular pirate resource Sci-Hub. Of course, such a legally vulnerable hint could result in strong objections from commercial publishers.
- Translated version(s) of the article usually appear only sometime after the publication of the original version. In this case, it is possible (from the attributes of the source file or thanks to the Crossref relations "isTranslationOf" and "hasTranslation" [54]) to determine on-the-fly whether the translation(s) has appeared and inform the reader about it.
- Let the online publication receive open reviews. Their list is publicly available and dynamically updated. Then the bibliographic reference can include information about the existence of a recent (say, no later than the last six months) review of the publication.
- Etc.



**Figure 4.** A reference to a YouTube video always includes the living number of views.

The inclusion of living information in the text of a bibliographic reference will make it significantly more informative and interesting for the reader. Depending on the load of the Internet channel and the server, dynamic attributes can either be created "on-the-fly," i.e., in the process of displaying the text of the bibliographic reference, or all the dynamic information stored on the server can be periodically updated, say, once a day (during a quiet time of night), to form actual texts of bibliographic references.

#### 10. Living Reference to Alive Publication

How can an alive publication be distinguished from a static one? Simply adding a special "Publication declared alive" icon to its web view is obviously not enough. After all, the author could place this icon once and then forget about it and his or her online text. Therefore, the only reliable evidence that the publication is alive is the fresh date of its recent revision. This date is placed prominently on the web page and serves as reliable guidance for the reader (Figure 5).



**Figure 5.** Banner of alive publication.

It is desirable for an alive publication to be noticed earlier when viewing the bibliographic reference leading to it. How, for example, can a reader viewing a bibliographic list distinguish an alive publication included in it from neighboring static publications? This can be done by adding a living construction of the form “Last updated  $\approx$  2023-02-15  $\approx$ ” to the bibliographic reference, where the characters “ $\approx$ ” frame the date of the last revision.

Here, support tools are essential [55,56], because it is impossible to imagine an ultra-conscientious author who constantly looks through the bibliographic lists of his or her online articles to correct the updated dates of alive publications every time.

When designing an alive publication, it is necessary to form the date of its last revision in a special way so that this date is available not only for the reader of the publication but also for other online articles that reference this publication. The author of an online article forms a living reference to an alive publication in his or her text using support tools, so that the date of the last revision in such a reference is automatically updated every time someone visits a web page. As already mentioned, to make it easy for the reader to notice the date of interest, this date is surrounded by the characters “ $\approx$ ”, for example:

Gorbunov-Posadov M.M. Alive publication // arXiv, 2021, 26 p. <https://arxiv.org/abs/2103.10761>, accessed on 4 January 2023, revision from  $\approx$  2023-02-17  $\approx$

Citations within the text also require attention. If the publisher uses a numbering (Vancouver) system for citations (citations of the type “[1]”), then such citations are fully suitable for alive publication. If the Harvard method is used (style “author-date”), then to avoid misunderstandings, it makes sense to enlarge the citation to the following living format “(Gorbunov-Posadov, 2007,  $\approx$  2022-12-18  $\approx$ )”, i.e., (<author>, <the year of the first appearance of the work online>,  $\approx$ <generated on-the-fly date when the latest revision of the alive publication appeared online> $\approx$ ).

For on-the-fly updated data in reference to an alive publication to become possible, two conditions are necessary. First, this date must be stored in the file of the alive publication and should be available for the software. Second, the file with a reference to an alive publication must allow for the implementation of inserting this date.

As mentioned above, tools for assigning values to arbitrary meta-attributes and, in particular, to the date of the last revision of the article are provided in all popular file formats of scientific publications: PDF, HTML, and MS Word. However, unfortunately, including this meta-attribute directly in the text of a living reference to an alive publication is not always possible. Currently implemented support tools successfully update the date of the last revision only if the article containing the reference is presented in HTML format.

It should be reminded that there are many HTML representations of bibliographic references on the Internet. There is no doubt that over time, there will be even more of them. Therefore, the tools for supporting a living date of an alive publication can be of practical use right now, and their scope will only expand.

Unfortunately, examples of the use of an alive publication’s living date in famous journals are not yet visible. The author of this article made several attempts to suggest to journals in the online HTML-version of his article that appropriate means be provided to support such dates. On each occasion, however, he received polite but firm rejections.

## 11. Discussion

What can be expected in the area of alive publications?

The coronavirus pandemic may push humanity to realize the need for civilizational unity. One of the expected obvious consequences could be the appearance of the project of a world multilingual scientific alive encyclopedia. Such a project would be a worthy alternative to Wikipedia.

The mass migration of authors to alive publications would cause many difficulties for publishers, reviewers, editors, lawyers, librarians, and bibliometrists. It will require the rethinking of some basic concepts and the reworking or the redeveloping of many of the software tools that support modern publications. However, the scale of these reforms is not so significant as to raise doubts about their speedy implementation. The main thing is that the results will benefit authors and readers, i.e., the principal actors in any publication.

Tools to support alive publishing are constantly being improved, and authors of scientific articles master the skills of handling online materials. Thus, maintaining an article in an alive publication mode is gradually becoming more uncomplicated and accessible.

Only absolute geniuses write perfect texts on the first attempt. All other authors will notice this or the imperfection of their publication after some time and will undoubtedly be happy to have a window of opportunity to improve, correct, or update it. A new paradigm for presenting the results of research is the future. Alive publications will replace many of the current forms of publications based on print traditions. In a few years, the scientist's mind will be transformed. Taking care to keep a publication up to date will become the norm; moreover, it will become a long-term, irresistible, and vital need, akin to a parent's care for a child's development.

## 12. Conclusions

The tools mentioned above can be seen in action in the HTML version of this article posted in the institutional archive <https://keldysh.ru/gorbunov/alive>.

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