New journal models and publishing perspectives in the evolving digital environment

Maria Cassella
University of Turin
Turin, Italy

Licia Calvi
Catholic University of Leuven
Leuven, Belgium

Abstract:
Open access combined with Web 2.0 networking tools is fast changing the traditional journals’ functions and framework and the publishers’ role. As content is more and more available online in digital repositories and on the web an integrated, interconnected, multidisciplinary information environment is evolving and Oldenburg’s model disintegrates: the journal is no more the main referring unit of the scholarly output, as it used to be mainly for STM disciplines, but scholars attention is deeply concentrated on article level. New journal models are thus evolving.

In the first part of this paper we will discuss these new experimental journal models, i.e.
- overlay journals
- interjournals
- different levels journals

In the second part we will drive readers’ attention on the role commercial publishers could play in this digital seamless writing arena.

According to the authors, publishers should concentrate much more on value-added services both for authors, readers and libraries, such as navigational services, discovery services, archiving and ex-post evaluation services.

The rise of open content

In 1665 Henry Oldenburg, the secretary of the Royal Society of London, published the first issue of the first scholarly journal, i.e. The Philosophical Transactions. Oldenburg’s idea was to create a registry of scientific innovations (Guédon, 2001), to overcome scholars dispersion, to foster the debate among scholars, to build a scholars’ community on scholarly topics. The Philosophical Transactions could be valued as a blogs’ ancestor, a work in progress, offering ideas, comments on scholarly topics.
Transactions was not a tool to enhance careers, neither was it a real quality control certification tool. Scholars were not professionals. They were well-off educated gentlemen devoted to science achievements.

Later on the story became much more complicated.

It was after the Second World War that scholarly information became a commercial matter: commercial publishers stepped in as a consequence of the growing amount of scientific production and quality control became a widespread practice in the publishers’ hands. From the World War to date the number of commercial journals has increased tremendously. As a matter of fact in 2008 Ulrich’s periodicals list registered 23,973 peer-reviewed journals. It is worldwide acknowledged that the established commercial journal system accomplishes the following functions (Roosendal and Geurts, 1997):

- **Registration**, which allows claims of priority for a scholarly finding.
- **Certification**, which establishes the validity of a registered scholarly claim.
- **Awareness**, which allows scholars to remain aware of new claims and findings. This is the function that fosters scholarly communication
- **Archiving**, which preserves scholarly findings over time.

A fifth function, i.e., *Rewarding* is often added to the previous four ones, as “journal recognition and prestige have a significant impact on the impressions of tenure and hiring committees” (Warner, 2005)

This long established scholarly publishing system is now becoming obsolete and is fast changing.

Although the debate on scholarly changes began well before the WWW advent (Gibbons et al. 1994) it is in the evolving digital environment that scholarly communication is changing radically and journals are becoming actors of a completely different story. Changes do not involve uniquely the STM segment but also the HSS one, although it is true that scholars in hard sciences grasp more rapidly digital tools, technologies and resources. A solid digital infrastructure is thus evolving in STM as well as in HSS disciplines.²

A set of “disruptive forces” are driving the change in scholarly publishing: technological,³ economic, distributional, geographic, interdisciplinary and even social forces (Cope and Kalantzis, 2009).

However the major and most visible cause of this change is the fact that scholarly content is no more exclusively concentrated in publishers’ hands but a growing mass of this intellectual knowledge is now accessible openly in the digital institutional and subject-specific repositories worldwide.

Whilst it is not in the scope of this article to trace the Open Access movement achievements it seems to us rather useful to stress the fact that there is a fast technical, scholarly and social development practice in the “repositories movement”: a growth in the number of repositories and in the number of e-items archived worldwide.

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¹ It was not until the year 1752 that the Royal Society of London adopted a review process such as the one that had been previously used by the Royal Society of Edinburgh as early as 1731. Cfr. Ray Spier (2002).
² On this topic see the thoughtful article by Stephen G. Nichols (2009).
³ Some authors recognize that the technological forces are in some cases less disruptive than the social and political behaviour “as well as the transfigured economics and new capabilities of global high-performance networking”. (Lynch, 2007)
According to Open Access advocate Peter Suber “OA journals and repositories proliferated faster in 2008 than in any previous year. [...] The number of OA repositories grew by 72 or 8% in Scientific Commons, 129 or 14% in OAIster, 271 or 28% in the Registry of Open Access Repositories (ROAR), and by 281 or 28% in the Directory of Open Access Repositories (OpenDOAR). Worldwide, more than five new repositories were launched every week during 2008” (Suber, 2009).

Up to April 2009 OpenDOAR lists 1375 repositories and ROAR 1312 while OAIster harvests 1103 repositories and provides access to 20,678,710 records.

Apart from the number of repositories that have been implemented to date, if we look more closely at the amount of articles available through Open Access on the total number of articles published in 2006 – approximately 1,350,000 - a percentage of 11.3% of usable copies can be found in subject or institutional repositories or, in alternative, on authors home pages (Bjoerk, Roos and Lauri, 2009).

It should however be admitted that it is very difficult to generalize scholars’ archiving behaviour across the multiplicity of scientific disciplines: as a matter of fact self-archiving practice is adopted in various ways by the different scientific communities.

To external observers the percentage of journal articles freely available on the Internet may appear modest and the growth of open access content is certainly slower than OA advocates foresee but the rate of scholarly open access articles (both preprints and postprints) is increasing yearly, as an increasing number of funder mandates, institutional and departmental mandates is supporting self-archiving.

Subject repositories in particular appear to be all very successful (Cope and Kalantzis, 2009).

The rise of this intellectual critical mass openly available has manifold consequences. Two among these appear to be disrupting for the established journal publishing system: 1. from discoverability (through interoperable repositories and search engines) to quantitative research evaluation scholars’ attention is all concentrated on article level: the five function-based vertically-integrated traditional journal model disintegrates and journals are no more the referring unit of the scholarly research. As a matter of fact the commercial journal system is becoming an artefact whose value is more related to scholars’ career than to the researchers’ needs. In their daily activity scholars make a tremendous use of preprints and of a vast array of unpublished material: raw data, reports, conference papers, working papers, reviews, but also wiki and blogs.

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4 Harnad et al. (2007) are even more optimistic. They calculated that a 15 % of all academic journals article were already available via open access in 2007.

5 All adopted mandates are registered in the ROARMAP http://www.eprints.org/openaccess/policysignup/. It should be remarked that most of them also mandate the deposit of the refereed postprint.

6 We refer to the Usage Factor study sponsored by the United Kingdom Serials Group to explore articles downloads as a basis for a new quantitative metrics and to its strictly correlated project Publisher and Institutional Repository Usage Statistics (PIRUS) whose aim is “to develop COUNTER-compliant standards and usage reports at the individual article level that can be implemented by any entity (publisher, aggregator, repository, etc.) that hosts online journal articles and will enable the usage of research outputs to be recorded, reported and consolidated at a global level in a standard way”: http://www.jisc.ac.uk/publications/documents/pirusfinalreport.aspx.
Career motivations and the tremendous inertia of the scholarly community (Odlyzko 1999) are therefore preserving the current publishing status quo;

2. New journals models are evolving both theoretically and experimentally. Many of these experiment the formula of decoupling content, already archived in repositories, from the publishing process and functions as in:
   - overlay journals
   - interjournals

We will now look more closely at these innovative journals experimentation, together with a third model: the different level journal. Later on we will concentrate our attention on the new role commercial and learned publishers could play in this evolving scholarly arena.

**Overlay journals**

In his Guide to the Open Access Movement (2003) Peter Suber gives us a very clear definition of overlay journal:

> “An open-access journal that takes submissions from the preprints deposited at an archive (perhaps at the author's initiative), and subjects them to peer review. [...] Because an overlay journal doesn't have its own apparatus for disseminating accepted papers, but uses the pre-existing system of interoperable archives, it is a minimalist journal that only performs peer review.”

As a matter of fact the concept of overlay journal was first addressed by Paul Ginsparg the father of the very first digital subject repository: ArXiv. In 1991 ArXiv established a completely new way of managing e-collection by fulfilling the need of the preprint communication system already adopted by the high energy physics scholars community (Goldschmidt-Clermont , 1965).

Like all other digital repositories ArXiv accomplishes all publishing functions aforementioned but certification.

In 1996 by discussing the growth of published journals and the drawbacks of established peer-review system Ginsparg connected the preprint server content to a certification function which can be performed outside the paper journal. “Any type of information could be overlayed on this raw archive and maintained by any third parties […] rather than face only an undifferentiated bitstream, the average reader could benefit from an interface that recommended a set of “essential reads” for a given subject from any given time period”. (Ginsparg, 1996)

Later on in the same year Ginsparg granted to learned societies the certification function to be performed thanks to overlay intellectual forms.” These global archives [ the repositories] are not at all incompatible with the filtering role historically provided by the journal system. To the contrary, they beckon for learned societies such as the APS to augment their current roles with new forms of intellectual overlays never before feasible” (Ginsparg, September 1996).

More recently Ginsparg proposes a three layers multiply interconnected knowledge network in which journals of the future “can exist in an “overlay” form, i.e. as a set of pointes to

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7 To follow the ongoing theoretical debate on the new journal forms see Paolo Dall’Aglio (2006).
8 [http://www.earlham.edu/~peters/fos/guide.htm](http://www.earlham.edu/~peters/fos/guide.htm).
9 David Shulenburger’s proposal (2007) for scholarly monographs is very similar to Ginsparg’s idea. For those volumes which do not find market distribution channels Shulenburger suggests that “scholarly societies should form peer-review bodies to examine such work of minor pecuniary value and to certify their scholarly worth”.

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selected entries at the data level […] article at the data level can be pointed by multiple such virtual journals, insofar as they’re trying to provide a useful guide to the reader” (Ginsparg, 2001).

The very first concrete application of this new model for e-journals comes also from the physics scholars domain.10 From the mid 1996 Physical Review D (PRD) a journal on particle and gravitational physics, used ArXiv to create a preprint overlay, linking to papers that were accepted for the journal but not yet published. Articles were published on a sort of overlaid ArXiv “pre-journal” a couple of months before they were published in the formatted issue (Smith, 1999).

The Simmetry, Integrability and Geometry: Methods and Applications (SIGMA) journal also defines itself as an ArXiv overlay journal, because “all published articles in the journal have been contributed or will be contributed to the arXiv. In addition, SIGMA web site has hyperlinks to arXiv copies”.11

Still referring to the physics domain, Naboj is a post-filter on papers published in ArXiv. It consists of readers rating papers on a five-point scale.

A very interesting example of a successful overlay journal can be also found in the medicine field: it is the case of the Lund Virtual Medical Journal, published by the Department of Strategic Communication of the Faculty of Medicine at Lund University. The original idea behind the LVMJ was to enhance “the visibility of ongoing research by the Lund University faculty, with the aim of showing all published faculty-authored articles” (Özek, 2005).

Articles for a journal issue are selected from those archived either by the faculties or by the library staff in LU:research,12 the institutional repository of the Lund University, and from records archived in PubMed.

The LVMJ editorial group concentrates its attention on the final peer reviewed manuscript version of the articles (postprint).

In all the above described examples, the certification function is still performed by publishers in its traditional form, which is very different from Ginsparg’s original idea, but it is clear that all the above journal experimentations recognize the importance of the preprint archives for the respective research communities.

The relationship between digital repositories, holding and disseminating the content, and the e-journal aggregation level, which performs the certification function, is very tight.

Very recently this relationship has been deeply investigated by the Repository Interface for Overlaid Journal Archives (RIOJA) Project.13 Funded by the JISC (Joint Information Systems Committee, UK), as part of its Repositories and Preservation Programme and led by UCL (University College London), the RIOJA project started in early 2007 and ended in August 2008 with the goal of developing an Application Programming Interface (API)14 to foster automated interaction between the journal software and the digital repositories. The journal software investigated was Open Journal Systems (OJS)15 an open source product of the Public Knowledge Project designed for the management and the publishing of an open access

10 A very early overlay journal used to be Advances in Theoretical and Mathematical Physics which provided only certification. Later on it has become a traditional journal. http://www.intlpress.com/ATMP/archive/volume04-1.html

11 http://www.emis.famaf.unc.edu.ar/journals/SIGMA/about.html#overlay.

12 http://www.lu.se/forsknings .

13 http://www.ucl.ac.uk/ls/rioja/.

14 “An application programming interface (API) is a set of routines, data structures, object classes and/or protocols provided by libraries and/or operating system services in order to support the building of applications.” Source: Wikipedia http://en.wikipedia.org/wiki/API.

15 http://pkp.sfu.ca/?q=ojs.
journal, while the repository investigated was ArXiv which is based on the EPrints Southampton software\textsuperscript{16}. The Astrophysics community worked together with librarians and arXiv staff to build an overlay journal demonstrator.\textsuperscript{17} The commitment of the scientific community was a strategy factor in the study to investigate scholars’ view on published journals and the reputation the latter carry on.

The RIOJA project also carried out a feasibility study on the costs and the sustainability of overlay journals.

The notion of “overlay journals” is still strictly based on a scholarly paper-driven journal model in which there is a rigid temporal distinction between the preprint not refereed version of a paper and its postprint refereed version. But what will happen if a paper becomes a “liquid publication”, in the sense of “an evolutionary, collaborative, multi-faceted knowledge object” which leaves the “solid form” of a publication, “written by a closed circle of authors, reviewed and published (typically in print) and that is then “set in stone” in the sense that it never changes from that point on” (Casati, Giunchiglia, Marchese, 2007)?

Would it still be possible to discuss about the different versions of a scholarly paper? When should the certification function be performed then?

In a few years’ time it is likely that a new concept of e-publication will overcome the rigid distinction between preprint and postprint and therefore quality control might become a continuous function that is no more performed ante (traditional journal) or post (overlay journal) the publication of a “solid “ journal, but embedded in the process of production of a “liquid publication”, completely changing the way research results are produced, evaluated and consumed.

**Interjournals, different level journals**

In the digital arena it is becoming more and more evident that scholars works in an interdisciplinary manner. As new publishing open access models breaks down barriers among disciplines and surveys on journal usage corroborate this statement\textsuperscript{18} it is also becoming quite obvious for publishing to explore new interdisciplinary area. Interdisciplinarity may of course affect only the journal content level – more articles published on different disciplines interrelated topics – or the journal form level as in the case of InterJournal (see next).

**InterJournal**\textsuperscript{19} is a referred journal developed as part of the activities of the New England Complex Systems Institute and covering topics in science and engineering. It does not host full-texts directly but only metadata and comments. Manuscripts and related raw or processed data, computer programs, video, audio are immediately accessible upon submission into six different categories of publications - General Audience Letter, Professional Letter, Review Article, Article, Brief Article and Report - and then evaluated by qualified referees who access the submitted manuscript and assign an appropriate subject area to it.\textsuperscript{20}

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\textsuperscript{16} \url{http://www.eprints.org/}.

\textsuperscript{17} 4000 astrophysicists were also investigated in a survey conducted for the project. 683 responses were received. “Preliminary findings indicate that researchers are, in general, sympathetic to the overlay model, albeit with concerns about the long-term accessibility of the research material, and the quality of the certification process.” (Press, 2007)

\textsuperscript{18} See, for example a survey conducted by Mayur Armin, an Elsevier consultant, on the usage of journals in Science Direct. One of the key findings of this survey is that while researchers in physics and mathematics use massively journals within their discipline (70% or more), researchers’ usage of journals in other disciplines, including chemistry and environmental sciences, within the discipline is at less than half that level.

\textsuperscript{19} \url{http://www.interjournal.org/}.

\textsuperscript{20} The main three journal subject areas are: Complex systems, Polymers and complex fluids, Genetics. Each area has its own editor.
Authors may decide that article access is limited to referees until the review process is completed. They may also choose for anonymity of the manuscripts.

Philica\textsuperscript{21} is also another example of an interdisciplinary, or better, a multidisciplinary journal. It defines itself as “an online academic journal accepting publications on any subject. Submitted manuscripts are immediately accessible and anonymously refereed by other professional researchers”. Only academics can register and hence publish papers and write reviews.

Philica is like eBay for academics. The impact of each review depends on the reviewer’s rating reviews: the opinion of somebody whose work is highly regarded carries more weight than the opinion of somebody whose work is rated poorly. Moreover the importance of a given review is affected by:

- Whether the reviewer has a confirmed status. \textit{People who have proved that they are bona fide professional researchers are a lot more influential.}
- The “age” of the review. \textit{Newer reviews carry slightly more weight than older reviews, to reflect changing opinions towards any given work.}

**Different level journals**

Less innovative than the two previous discussed models and nevertheless innovative is the notion of “different level journal”. This type of journal do not rest upon content archived in repositories. It is rather based on the idea of creating a topic-based journal, as a macro-collection structured in sub-collections.

An example of this journal model is The B.E. Journals in Theoretical Economics. The B.E. Journals in Theoretical Economics\textsuperscript{22} is a multi-tiered level journal on all areas of economic theory published by the Berkeley Electronic Press.

The \textbf{Advances} tier publishes articles that make significant advances in theoretical economics. The \textbf{Contributions} tier publishes articles on important contributions on relevant literatures. The \textbf{Topics} tier publishes articles on specific topics and area of theoretical economics. Each article is submitted simultaneously for these three quality-rated journals.

The editor, after standard peer review, decides in which of the three journals would be most appropriate to publish the article.

A similar policy is used by the Berkeley Electronic Press for The B.E. Journals in Economic Analysis & Policy (four journals in one) and The B.E. Journals in Macroeconomics (four journals in one).

What we may observe from this latter journal model is a trend towards content aggregation and specialization at the same time. This trend is also supported by authors’ and users’ needs. As a matter of fact according to a Ciber survey (2005) authors assign a great value to the possibility of being able to reach deeply into a specialist readership for their article. This could be a good reason for publishers to differentiate a journal in analytical tiers.

\textsuperscript{21} \url{http://philica.com/about.php} .
\textsuperscript{22} \url{http://www.bepress.com/bejte/ratingsystem.html} .
A new role for the publishers

We are now in the early day of these new journal models. To a certain extent “it is not even clear what “overlay journals” means. If it just means conventional journals implementing online peer review by having submissions deposited on a web site and the directing referees and revised drafts to the site, then most journals are already overlay journal in this banal sense” (Harnad, 2005). This is not the case of “true” overlay journals which should fulfil the fundamental function of certification on repositories archived content. Experiments on new journal models appear up to date cumbersome and some of them have not been successful. However, these naïve experimental journals are dismantling the five function-based publishers role. In particular the concept of “overlay journals” may be troublesome for publishers as it challenges one of the very last function held firmly by publishers themselves: certification.23 If they lose control on scholarly content what is the alternative left to publishers to continue to play a significant role for the scholars communities?

Commercial publishers may:
either decide to strive to maintain the quality control by managing themselves different forms and levels of journals overlaying repositories possibly combining the traditional way to perform the certification function with the new Web 2.0 social peer review tools by aggregating comments and ratings now flourishing in well established peer-reviewed journals (e.g. PLoSOne, Atmospheric Chemistry and Physics) or in a less formal scholarly environment such as the blogs and wikis arena, whose importance for scholars is growing every day.
For this option commercial publishers would still concentrate their attention on the certification function and on navigational services (Armbruster, 2007);
or they may give away the certification control to other parties (learned societies, scholarly communities,24 scientific social networks, OAI peer-review services25 or similar entities) and invest massively on new value-added services, such as, for example, navigational services, semantic discovery services,26 translation services, archiving (post-cancellation archiving services, long term preservation services)27 and ex-post evaluation services (bibliometric analysis, usage-based analysis) while giving away the registration, the awareness and the certification functions.
For this option commercial publishers could adopt business “lightweight” models which should be no more related to the journal subscription model than to the complete set of services offered charging both institutional fees or individual fees.

23 As a matter of fact commercial publishers control certification but the function is really performed by scholars who do not receive a remuneration for their work, with very few exceptions. Costs for peer-review are really shifted to the scientific community, to the institutions scholars work for and to the general public.
24 A community review model has been adopted for the conference EclipseCON 2006.
25 It is very innovative the idea developed by M. Rodriguez (et al.) of “a deconstructed publication model in which the peer review process is mediated by an OAI-compliant peer-review service. This peer-review service uses a social-network algorithm to automatically determine potential reviewers for a submitted manuscript and for weighting the influence of each participating reviewer’s evaluations.”
26 We agree with Roosendaal and Geurts’ statement (1997) that “value is not anymore in information proper but in its effective and efficient communication”.
27 Publishers are already involved in many different long term preservation projects i.e. Portico, CLOCKSS, LOCKSS, E-Depot. In the digital environment publishers share with libraries, foundations, authors the responsibility for the long term preservation of the digital memory.
Institutions may be more interested in navigational, archiving and ex-post evaluation services, while authors may be more attracted towards the translation, navigational and discovery services besides be interested in obtaining accurate bibliometric analysis of their research work.

As a matter of fact we are now already seeing some publishers experimenting new kind of services:

**Nature Precedings**\(^{28}\) is an online free service launched in 2007 by the Nature Publishing Groups. Scholars of the hard sciences field can share documents by posting preprint manuscripts, white papers, technical reports, posters, and presentations. Everything posted in Nature Precedings can be then rated and commented. NP describes itself as a complementary service to peer-reviewed journals.

**Faculty of 1000** Biology and **Faculty of 1000** Medicine are a BioMed Central subscription services which allow researchers to rate peer-reviewed articles in biology and in medicine. Each Faculty member can assign a rating choosing from three options: Recommended, Must Read, and Exceptional. According to Armbruster (2007) 2,300 members had commented over 35,000 articles for Faculty of 1000 Biology in 2007.

**Living Reviews**\(^{29}\) is a set of five open access refereed review journals: Living Reviews in Relativity, Living Reviews in Solar Physics, Living Reviews in European Governance, Living Reviews in Landscape Research, Living Reviews in Democracy. The notion of “living article” was first expressed by Bernard F. Schutz and Jennifer Wheary who in 1998 started at the Max Planck Institute for Gravitational Physics the first journal: i.e. *Living Reviews in Relativity*. The five journals offer “surveys of recent work, evaluations of the importance and interconnections of results, summaries of important results, entry points into the essential literature, assessments of where new progress is needed, access to web sites and other useful electronic contacts, and databases of the recent literature”.\(^{30}\) An Editorial Board solicits the “living” review articles that are regularly updated by researchers to incorporate latest developments in the fields. Authors are encouraged to submit at least an annual update of their review. The new version of the review article is published as soon as it is received, while the previous version remains available on article’s history page. The concept of “Living Reviews” is much closer to a service than to a journal. It is an ex-post evaluating service publishers might offer in the future.

**Conclusion**

In a few years’ time “the “institutional repository” movement could lead to the creation of many new hubs for scholarly content” (Van de Sompel et al., 2004) supporting a new “global knowledge network” and it will be possible to implement a completely new qualitative and

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28 [http://precedings.nature.com/](http://precedings.nature.com/).
30 [http://relativity.livingreviews.org/About/concept.html](http://relativity.livingreviews.org/About/concept.html).

quantitative evaluation research system\textsuperscript{31} thanks to the freely available content, to the technology “revolution” and to the Web 2.0 social evaluation spreading practice. At the moment the greatest challenge for creating an effective new evaluation system both controlled by publishers or by other parties is to combine the best of the current scholarly peer-review model which is still widely supported by academics \textsuperscript{32} and the best of the new social alternative evaluation approaches, the so called “Wisdom of the crowds” of which Wikipedia is the most successful and long-lasting example. The combination of the two approaches will allow the current scholarly communication system to overcome all the main drawbacks of the traditional paper-focused peer review system (biased, unreliable, expensive, open to abuse, too long period for the acceptance and consequent delay in publication) while in the meantime cutting on costs and finding an effective and scalable way of evaluating the million scholarly papers published and rising every year.

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\textsuperscript{31} In literature it is often referred to peer review as a form of *ex-ante* qualitative evaluation and to bibliometric analysis as a form of *ex-post* quantitative evaluation of scholarly works.

\textsuperscript{32} According to a Primary Research Group survey (2008) peer review is widely supported by scholarly communities: 93% of scholars surveyed disagreed that peer review is unnecessary.

\textsuperscript{33} All URLs were last controlled on the 16th of May 2009.

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