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Model(s) of the future? Overlay journals as an overlooked and emerging trend in scholarly communication

Modèle(s) de l'avenir ? Les revues épirevues en tant que tendance négligée et émergente dans la communication savante

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Article abstract

Overlay journals, a potentially overlooked model of scholarly communication, have seen a resurgence due to the increasing number of preprint repositories and preprints on coronavirus disease 2019 (COVID-19) related topics. Overlay journals at various stages of maturity were examined for unique characteristics, including whether the authors submitted their article to the journal, whether the peer reviews of the article were published by the overlay journal, and whether the overlay journals took advantage of opportunities for increased discovery. As librarians and researchers seek new, futuristic models for publishing, overlay journals are emerging as an important contribution to scholarly communication.

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Model(s) of the future? Overlay journals as an overlooked and emerging trend in scholarly communication

Modèle(s) de l'avenir ? Les revues épirevues en tant que tendance négligée et émergente dans la communication savante

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Abstract: Overlay journals, a potentially overlooked model of scholarly communication, have seen a resurgence due to the increasing number of preprint repositories and preprints on coronavirus disease 2019 (COVID-19) related topics. Overlay journals at various stages of maturity were examined for unique characteristics, including whether the authors submitted their article to the journal, whether the peer reviews of the article were published by the overlay journal, and whether the overlay journals took advantage of opportunities for increased discovery. As librarians and researchers seek new, futuristic models for publishing, overlay journals are emerging as an important contribution to scholarly communication.

Keywords: overlay journal, preprint repository, scholarly communication, open access, peer review

Résumé : Les revues épirevues, un modèle de communication scientifique souvent négligé, ont connu une résurgence en raison du nombre croissant de dépôts d'archivage numériques de prépublications et d'articles en prépublication sur des sujets liés à la COVID-19. Des épirevues ont été examinées à divers stades de leur maturité concernant diverses caractéristiques uniques : si les auteurs ont soumis leur article à la revue, si les révisions par les pairs de l'article ont été publiées par l'épirevue et si les épirevues ont profité des opportunités de découverte accrues. Alors que les bibliothécaires et les chercheurs cherchent de nouveaux modèles avant-gardistes pour l'édition savante, les épirevues émergent désormais comme étant une contribution importante à la communication savante.

Mots clés : épirevue, dépôt d'archivage numérique, communication savante, libre accès, révision par les pairs

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Introduction

Despite their creation in the late 1990s, resurgence during COVID-19, and recent endorsement as a model of the future, overlay journals are largely understudied. In order to address this research gap, the research goal is to create a detailed, exhaustive compilation of overlay journal characteristics to provide a more complete understanding of this important model of scholarly communication.

Literature review and research questions

The term overlay journal was coined in 1996 by Paul Ginsparg, who developed the arXiv preprint repository in 1991 (Brown 2010). An overlay journal is "[a]n open-access journal that takes submissions from the preprints deposited at an archive…and subjects them to peer review" (Suber 2004). A traditional journal serves five functions: registration, archiving, awareness, rewarding, and certification (Brown 2010; Casella and Calvi 2010; Roosendaal and Geurts 1997; Van de Sompel et al. 2004; Warner 2005). Registration establishes claims of precedence for a scholarly finding. Archiving preserves the scholarly record over time. Awareness allows scholars to discover new scholarly claims/findings, and rewarding allows authors to benefit from citations and recognition. Certification establishes the validity of a registered scholarly claim through peer review. A preprint repository performs all but one of these five functions—certification (Cassella and Calvi 2010). An overlay journal performs certification; hence, combining an overlay journal and a preprint repository fulfills all five functions of a traditional journal.

Created in the late 1990s, the motivation for overlay journals has been directly or indirectly attributed to the costs associated with traditional journals (Ball 2015; Conover 2016; Neumann 2010). Recently, the motivation for overlay journals has been directly related to the overwhelming number of preprints on COVID-19 deposited in preprint repositories, starting in 2020 (Free 2020). Overlays peer review preprints, a critical service in light of the onslaught of uncertified scholarly claims. Increased pandemic use of preprint repositories may help progress the Confederation of Open Access Repositories (COAR) vision for Next Generation Repositories which sees repositories, that are overlaid with value-added services, as the future infrastructure for scholarly communication (Rodrigues et al. 2017). Overlay journals can provide these value-added services to preprint repositories (COAR Notify 2022; Matthews et al. 2019). Because overlays use the existing infrastructure of preprint repositories, publishing becomes more efficient and financially sustainable (Dawson 2021). The advantage for authors submitting to an overlay journal is that their preprint is immediately discoverable during the certification process which is critical given a recent review of 171 major academic journals found 39.2% had unclear preprint policies (Klebel et al. 2020).

Addressing the following research questions, the research objective is to evaluate the current state of overlay journals at various stages of maturity by considering four factors: Timeline, Status, Evolution and Certification, and Awareness and Rewarding.

1) Timeline: how does the timeline for overlay journals' development align with the emergence of new repositories, licencing agreements, and software platforms?
   a) Which preprint repositories do overlay journals use?

b) How were repositories used during the COVID-19 pandemic?
c) What licencing agreements facilitate the overlay journal?
d) What software platforms are used by overlay journals?

2) Status: what can be learned from overlay journals considering how they came to be or ceased to be overlay journals?
   a) When was the overlay journal established and when did it publish its first article?
   b) Was the overlay journal an overlay at outset, did it switch to overlay, or is it no longer an overlay?
3) Evolution and Certification: how have overlay journals evolved by considering the type of peer review (certification), how the overlay journal finds content, and where the preprint is deposited?
   a) Is peer review for the overlay journal like traditional journals?
   b) How does the preprint get considered by the overlay journal?
   c) What fees are associated with overlay journals?
4) Awareness and Rewarding: while imperative to evaluate the overlay journal in its essential role of Certification, it is important to consider whether the overlay journal provided additional opportunities for Awareness and Rewarding?
   a) Are opportunities to increase awareness (i.e., indexing) taken by overlay journals?
   b) Are journal-based metrics (i.e., journal impact factor) available for overlay journals?
   c) Are article-based metrics (i.e., downloads) available for overlay journals?

Methods

Library and Information Science Source (LISS) and Library and Information Science Abstracts (LISA) searches for "overlay journal" OR "overlay journals" returned 12 unique English language articles, and their bibliographies were screened. The same search terms were used in Google thereby including grey literature. For the first 10 pages of Google results, titles were screened. Purposive sampling was used in Google for software platforms and journal titles including journal titles identified using the "overlay" tag in the Open Access Tracking Project (Open Access Tracking Project 2022; "Overlay Journals" 2022). Searches were performed in January 2021 and updated in January 2022.

To address Timeline, Status, and Evolution and Certification, 11 categories were created to analyze overlay journals' development, populated with information predominantly from journals' websites (Appendix 1). The categories include "journal title," "year established as overlay," "first article as overlay," "preprint repository," "licence," "content acquisition," "peer review," "software platform," "publisher," "support," and "associated fees." "Content acquisition" indicates whether the author submits, or the journal selects the articles. "Peer review" was populated with information regarding the reviewer's identity, recorded as either "visible" or "anonymized," (Jones et al. 2020) and the review's visibility, recorded as either "public" or "private." Where peer review has limited details, the default was anonymized, private peer review. "Support" includes funding or administrative support. Overlays were

included if sufficient information was available, either from the journal's website or additional sources.

To address Awareness and Rewarding, journal websites and supplemental sources were used. ISSN numbers were found using the journal's website and verified in ISSN Portal. To further evaluate journal-based indexing and metrics, journal titles were searched in the Directory of Open Access Journals (DOAJ), Free Journal Network (FJN), Web of Science (WoS), Scopus, and Google Scholar (GS). To evaluate article-based indexing and metrics, specific articles from each journal were searched in GS. Article websites were evaluated for views, downloads, citations, and comments (Borchardt et al. 2020). Likewise, any use of Altmetric or Dimensions was noted.

If overlays were in WoS (Clarivate), Scopus, or GS, metrics were evaluated. While not all overlays may be indexed in these databases, and are perhaps indexed elsewhere, WoS, Scopus, and GS were chosen as most journals are mathematics and sciences in nature. Clarivate Journal Citation Reports (JCR), Journal Impact Factor (JIF), Scopus CiteScore, and GS h5-index and h5-median were examined. 2020 JIF refers to the number of citations in 2020 to publications published in 2019-2018 divided by the number of publications in 2019-2018 (Clarivate 2021). 2020 CiteScore refers to the number of citations in 2020-2017 to publications published in 2020-2017 divided by the number of publications in 2020-2017 (Scopus 2021). While GS only indexes articles, GS Metrics orders journals by their five-year h-index and h-median metrics when the journal has published at least 100 articles in the five-year period from 2016 to 2020. The h5-index of a journal is the greatest number h such that at least h articles in that journal were cited at least h times each (Google Scholar n.d.-a). The h5-median of a journal is the median of the citation counts for the articles on which the h5-index is based. GS Metrics are based on citations from all articles indexed in July 2021 (Google Scholar n.d.-b).

To further address Timeline, the number of preprints per year was investigated for three preprint repositories used by overlay journals: arXiv [URL 1], bioRxiv [URL 2], medRxiv [URL 3]. For 2020 and 2021, the number of COVID-19-related preprints [URL 4] was compared to the total number of preprints. Analyses were performed January 21, 2022.

Methods to analyze overlay journals' structure were pre-tested by Thornton and Kroeker (2021). The current study represents a significant advancement from Thornton and Kroeker (2021) by analyzing fourteen additional overlay journals, examining journal- and article-based indexing and metrics to consider Awareness and Rewarding, discussing issues of sustainability and scalability, and updating the preprint analysis with 2021 data.

Results

Timeline

The timeline in Figure 1 outlines the years the 45 overlay journals were established, and the number of overlays established each year. The timeline is collapsed to show the years relevant to the 45 overlays (Table 1). As context, three preprint repositories, arXiv, bioRxiv, and medRxiv, are shown on the timeline. The first

overlay journals appear in 1997 and were overlaid on arXiv, which launched in 1991. Twenty-eight of 45 overlays use arXiv as a preprint repository (Table 1). Even though bioRxiv launched in 2013, overlays did not appear on bioRxiv and medRxiv (launched in 2019) until 2019. As of 2019, four overlays use medRxiv and/or bioRxiv. Other repositories used by overlay journals include Hyper Articles en Ligne (HAL), GitHub, and PsyArXiv (Table 1 and Appendix 1). *ST-Open* uses Croatian repositories as its purpose is to promote Croatian students' research visibility and quality through practical publishing experiences (Marušić et al. 2019).

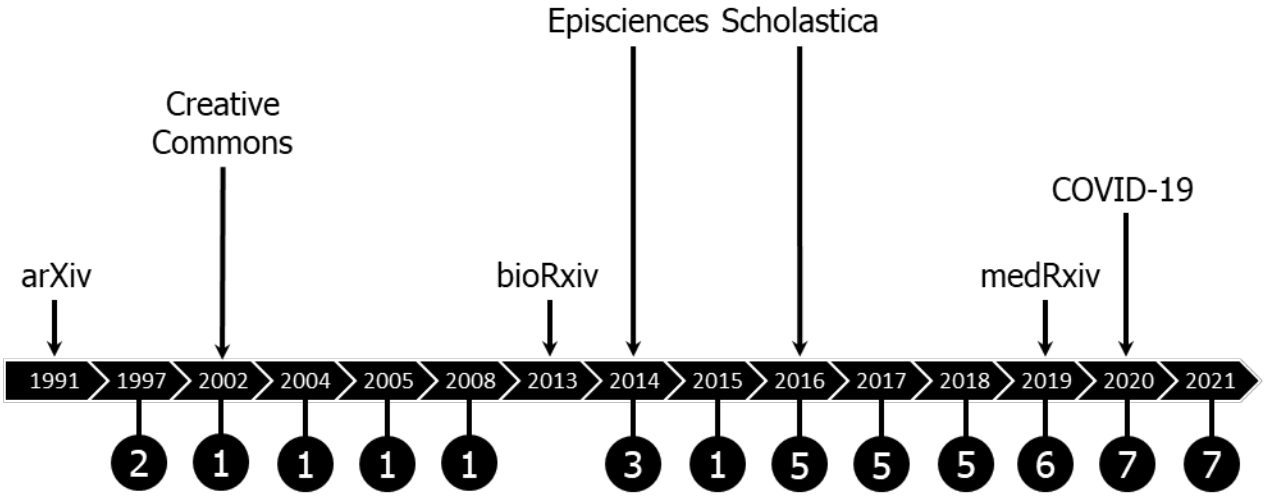

Figure 1: Overlay Journal Timeline
Timeline collapsed to only show years relevant to overlay journals.
Numbers below timeline are the number of overlay journals established in each year.
Text above timeline are relevant events in specific years.

Journal Title	Year Established	First Article	Preprint Repository		Peer Review		Content Acquisition	
			arXiv	Other repository	Anonymized/ Private	Visible/ Public	Author submitted	Journal selected
Overlay at outset								
RR:C19	2020	- 2020 Reviews		✓		✓		✓
JMIRx Med	2019	2019		✓		✓	✓	✓
JMIRx Bio	2019	-		✓		✓	✓	✓
JMIRx Psy	2019	-		✓		✓	✓	✓
ST-Open	2018	2020		✓	✓*		✓	✓
JOSE	2018	2018		✓		✓	✓	
JOSS	2016	2016		✓		✓	✓	
ReScience C	2015	2015		✓		✓	✓	
SIGMA	2005	2005	✓		✓		✓	
Scholastica								
Ars Inveniendi Analytica	2020	2021	✓		✓		✓	
MELBA Journal	2020	2020	✓		✓		✓	
Compositionality	2019	2019	✓		✓**	✓**	✓	
Advances in Combinatorics	2018	2019	✓		✓		✓	
NBDT	2018	2018	✓		✓***		✓	
Quantum	2017	2017	✓		✓		✓	
Discrete Analysis	2016	2016	✓		✓		✓	
OJA	2016	2016	✓		✓		✓	
Episciences								
TheoretiCS	2021	-	✓		✓		✓	
MOS	2021	2021		✓	✓		✓	
JTCAM	2020	2021	✓	✓	✓*		✓	
MNA	2020	2021	✓	✓	✓		✓	
EpiDEMES	2019	-	✓	✓	✓		✓	
JNSAO	2019	2019	✓	✓	✓		✓	
Sociétés plurielles	2017	2017		✓	✓		✓	
Slovo	2017	2017		✓	✓		✓	
Epiga	2016	2017	✓	✓	✓		✓	
JIMIS	2016	2016	✓	✓	✓		✓	
JDMDH	2014	2014	✓	✓	✓		✓	
LMCS	2004	2005	✓		✓		✓	
ARIMA	2002	2002		✓	✓		✓	
Switch to overlay								
eLife	2020	2022		✓	✓**	✓**	✓	
Scholastica								
Internet Mathematics	2017	2017	✓		✓		✓	
Episciences								
CM	2021	-	✓		✓		✓	
JPE	2021	2021		✓	✓		✓	
OCNMP, formerly JNMP	2021	2021	✓	✓	✓		✓	
EID	2021	2021		✓	✓		✓	
FI	2021	2021	✓		✓		✓	
jGCC, formerly GCC	2020	2020	✓	✓		*	✓	
HRJ	2014	2015	✓	✓	✓		✓	
DMTCS	2014	2015	✓	✓	✓		✓	
No longer overlay								
biOverlay (2020 closed)	2018	2018		✓		✓***		✓
The Idealis (2019 closed)	2017	2017						✓
JIPS (2021 closed)	2008	2010	✓	✓	✓		✓	
G&T (2012[1])	1997	1997	✓		✓		✓	
JHEP (2012[1])	1997	1997	✓		✓		✓	

[1](Priem & Hemminger 2012); *Visible/Private; **Output 1: Anonymized/Private or Visible/Private; Output 2: Anonymized/Public or Visible/Public; ***Anonymized/Public

Table 1: Overlay Journal Structure

The first overlay journals appeared in 1997 and were overlaid on arXiv (Table 1). The arXiv preprint repository was launched in 1991 (Figure 1). With 337 preprints in 1991, arXiv had 180,677 preprints deposited in 2020 and 224,202 preprints deposited in 2021 (Figure 2). BioRxiv started with only 77 preprints in 2013 and had 38,075 preprints deposited in 2020 and 40,941 preprints deposited in 2021. Despite only launching in 2019 with 789 preprints, medRxiv had 13,350 preprints deposited in 2020 and 13,433 preprints deposited in 2021 (Figure 2). For the year 2020, COVID-19 preprints represented 1% of the total number of preprints in arXiv, 7% in bioRxiv, and 65% in medRxiv (Figure 3). For the year 2021, COVID-19 preprints represented 1% of the total number of preprints in arXiv, 6% in bioRxiv, and 51% in medRxiv (Figure 3).

The first Creative Commons (CC) licences were available in 2002 (Creative Commons n.d.) (Figure 1). Where licencing and copyright information was given, most overlays required CC licencing, usually as determined by the preprint repository (Appendix 1). Two overlays started in 1997, prior to the creation and use of CC licences (Figure 1). *Geometry and Topology* (*G&T*) copyrighted the arXiv version using "Geometry and Topology Publications" from 1997-2005 and provided no copyright statement from 2006-2007. *Journal of High Energy Physics* (*JHEP*) provided no copyright statement from 1997-2002, copyright "SISSA/ISAS" (Scuola Internazionale Superiore di Studi Avanzati/International School for Advanced Studies) from 2002-2006, and copyright "SISSA" from 2007-2009. Interestingly, *G&T* and *JHEP* are no longer overlays. Two overlays, *Journal of Open Source Software* (*JOSS*) and *Journal of Open Source Education* (*JOSE*), allow authors to use either CC licencing or Open Source Initiative (OSI) licencing.

Episciences (starting in 2014) and Scholastica (starting in 2016) are the dominant software platforms (Table 1, Figure 1). Twenty-two overlays use Episciences, a free software (Episciences n.d.), and nine overlays use Scholastica. Some overlays have custom-developed software, such as PubPub from Knowledge Futures Group for *Rapid Reviews: COVID19* (*RR:C19*). Other options include Open Journal System by Public Knowledge Project, Sphinx, and WordPress with PressForward. Interestingly, three of the overlays from the 2000s use the Episciences software platform as of 2014. The two journals in 2014 that switched from traditional to overlay journals also switched to the Episciences platform.

Status

Forty-five overlay journals with sufficient information were identified (Table 1). Thirty-nine published at least one article as an overlay journal, and six were established but have not published their first article as an overlay journal (Table 1). One example is *RR:C19* which was established in 2020 and has published peer reviews but has not published a formal article yet. Additionally, although *JMIRx Med* published its first article in 2020, *JMIRx Bio* and *JMIRx Psy*, which are overlays from the same publisher, had not published first articles at the time of analysis.

Thirty of the 45 overlay journals were overlay at outset, ten were switched to overlay and five were no longer overlay (Table 1). Of the 30 that were overlay at outset, eight used Scholastica, thirteen used Episciences, and nine used other software platforms.

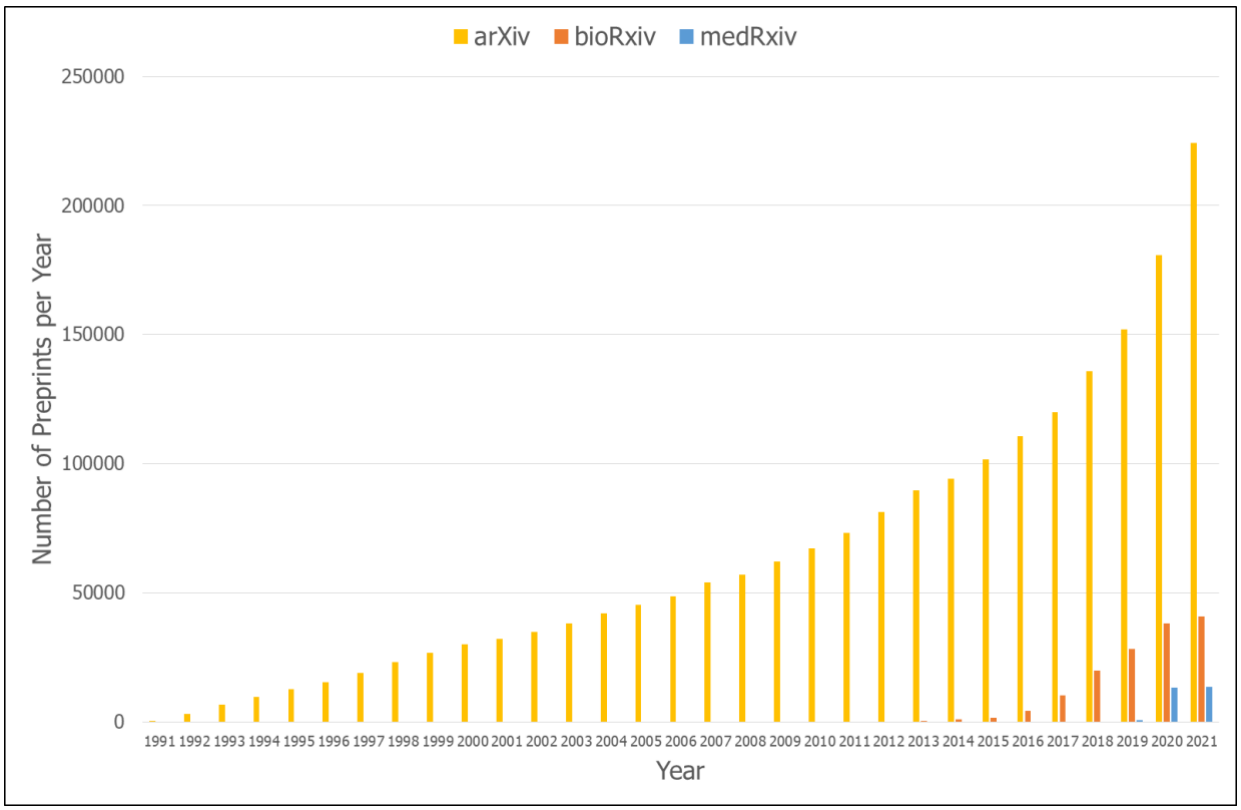

Figure 2: Number of Preprints per Year in arXiv (1991-); bioRxiv (2013-); medRxiv (2019-)

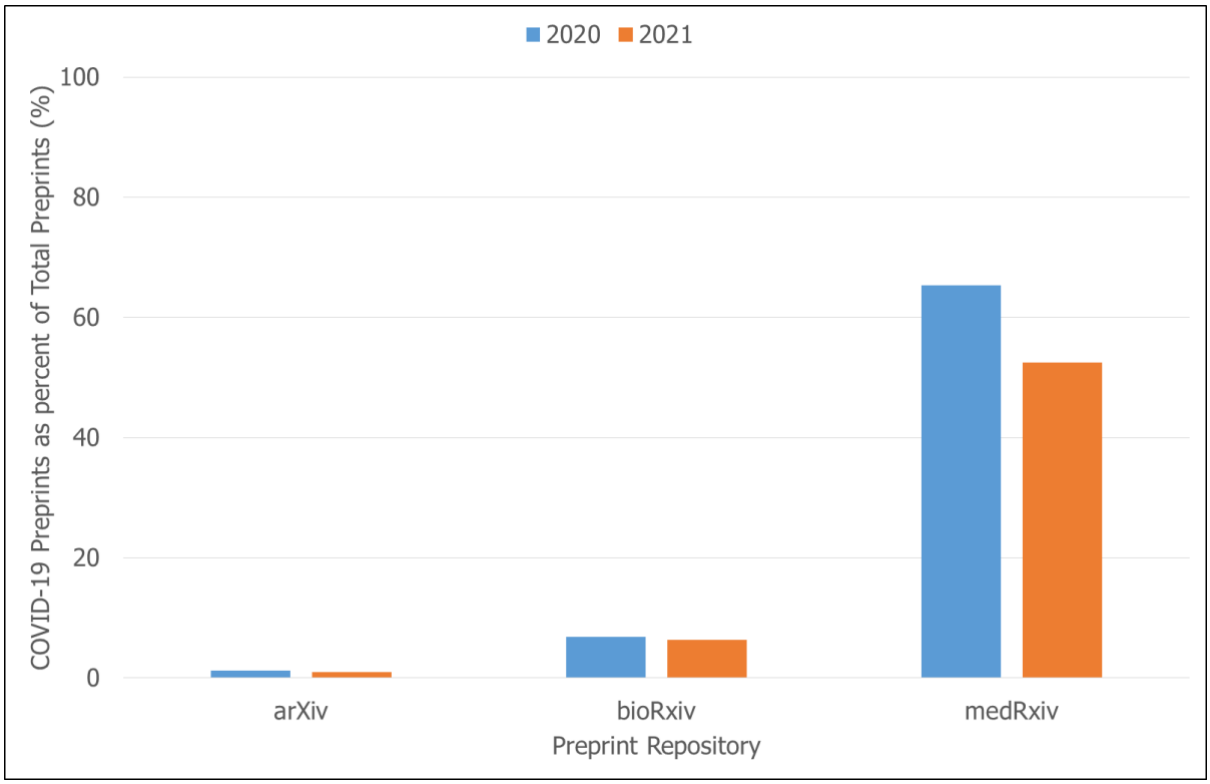

Figure 3: COVID-19 Preprints as percent of Total Preprints in 2020 and 2021

Of the 45 overlay journals, ten switched to overlay. Two switched to an overlay from a traditional publishing model in 2014 (Table 1): *Hardy-Ramanujan Journal* and *Discrete Mathematics & Theoretical Computer Science* (*DMTCS*). Berthaud et al. (2014) reported that *DMTCS* was in the process of switching to an overlay using Episciences software. In fact, eight of the ten journals that switched to overlay use Episciences software with two of the eight switching in 2014 and six of the eight switching between 2020 and 2021 (Table 1 and Appendix 1). While *eLife* started in 2012, it switched to an overlay between December 2020 and July 2021 (Eisen et al. 2020).

Of the 45 published overlay journals, five are no longer overlays. Priem and Henninger (2012) report that *G&T* and *JHEP,* both established in 1997, have ceased to be overlay journals. *G&T* and *JHEP* switched from overlays to traditional journals. *Journal d'Interaction Personne Système* (*JIPS*) is suspended as of December 2021. *The Idealis*, a LIS overlay, spanned from 2017 (Troia 2017) to 2019 (Google Scholar 2021). Additionally, *biOverlay* was designed as an "experiment with the goal of testing detailed, portable comments for preprints" (Greene 2020) and spanned from 2018-2020.

Evolution and certification

Thirty-eight of 45 overlays include author submitted content, three overlays include journal selected content, and four overlays include both author submitted, and journal selected content (Table 1). While using author submitted content functions much like that of traditional journals, overlays using journal selected content seek out preprints directly from the repositories using various methods, independent of the preprint's author(s). *ST-Open* uses a hybrid method where authors submit preprints or editors select, solicit, or recommend preprints to the journal. *JMIRx* overlays use acquisition and review editors to find articles, with the option for authors to self-nominate. *RR:C19* identifies preprints for review using COVIDScholar, a software that uses algorithms to search and find relevant COVID articles for review without needing the author to submit or self-nominate (University of California, Berkeley n.d.).
The most common type of peer review was anonymized, private peer review with 30 of 45 offering exclusively that option (Table 1). All the journals with anonymized, private peer review were overlay journals on arXiv or HAL. The next most common type of peer review was visible, public peer review with seven overlays offering exclusively that option. Three of the journals with visible, public peer review were overlays on GitHub, as of 2015, and four were overlays on medRxiv, bioRxiv, and PsyArXiv, as of 2019. *RR:C19* publishes peer reviews with a digital object identifier (DOI) which provides that reviewer with a published, citable review. Both *RR:C19* and *JMIRx Med* publish peer reviews with DOIs. Six journals offered unique combinations of peer review options. *biOverlay* offered anonymized or visible, public peer review. Two journals offered anonymized or visible, private peer review: *Journal of Theoretical, Computational and Applied Mechanics* (*JTCAM*) and *ST-Open*. *Neurons, Behavior, Data Analysis and Theory* (*NBDT*) provided anonymized, public or private peer review. Currently, peer reviewers for *eLife* produce two outputs: comments for the public and detailed feedback for the authors. Peer reviewers for *eLife* can select whether to be identified. The public reviews are posted on Sciety, an *eLife* product. Recommendations for the authors in the private feedback may be made public in the public editorial decision letter posted with the

published article. *Compositionality* allows peer reviewers to decide if they want their reviews to be anonymized or visible. *Compositionality* also indicates that they may publish reviews as commentaries alongside published manuscripts, but this was not observed in practice.

The least consistent details are publisher, support, and fees (Appendix 1). Twenty-one overlays listed a publisher, while 24 overlays did not. In some cases, the publisher is a discipline-specific association. While 19 overlays do not charge authors, *eLife* charges US$3000 and Quantum charges €450, which can be discounted or waived. However, costs are associated with the production of overlay journals. Scholastica charges the journal US$10 per published article (Ball 2015; Conover 2016). As such, a wide variety of funding models exist, with donors, institutions (government organizations, libraries, and universities), and foundations covering fees. For Episciences, INRIA and CNRS sponsor the platform, allowing overlay journals to waive fees for authors and readers (OCNMP n.d.). Queen's University Library covers the costs of *Advances in Combinatorics* and offers administrative support (Queen's University Communications Staff 2018). Likewise, University of Texas at Austin Libraries financially supports *Ars Inveniendi Analytica* (University of Texas at Austin 2021).

Awareness and rewarding

Considering journal-based indexing and metrics, the data for the overlay journals are presented using three Status categories (Table 2): "Overlay at outset," "Switch to Overlay," and "No longer Overlay." The data are further subcategorized by Scholastica or Episciences software platforms, where appropriate. Eighteen of the 45 overlays are members of the DOAJ (Table 2). Nine of the 45 overlays are members of the FJN. Thirteen overlays were indexed in WoS and 16 were indexed in Scopus. GS Metrics were reported for ten overlays, six of which had rankings in the top 20 of their respective subcategories.

Clarivate JCR JIF, Scopus CiteScore and GS Metrics were examined for the available overlay journals (Table 3). Data were available for seven "Overlay at outset", eight "Switch to Overlay" and two "No longer Overlay." For "Overlay at outset", the highest percentile of 2020 CiteScore was greater than 50% for three journals and less than 50% for three journals (Table 3), indicating a variety of performance. The 2020 CiteScore for *Discrete Analysis* was in the 94th percentile for the category "Algebra and Number Theory." In JCR, only five were listed; two had around 20 total articles in 2020, and three had greater than 70 total articles in 2020 and a 2020 JIF. The 2020 JIF for *Quantum* was in the 90th percentile for the category "Physics, Multidisciplinary." Of the overlays at outset, four had GS Metrics of which two were ranked in the top 20 for their subcategories. For example, *SIGMA* had 2020 CiteScore in the 59th percentile for "Geometry and Topology," 2020 JIF in the 32nd percentile for "Physics, Mathematical," and 2021 GS Metric rank of 15th for "Mathematical Physics." For "Switch to Overlay," one switched in 2014, one in 2017, and the rest in 2020-2021, indicating that for most of the switched journals, the metrics (which can include data from 2016) are for previous incarnations. *DMTCS* (switched to overlay in 2014) had 2020 CiteScore in the

Journal Title	Year Established	First Article	ISSN	DOAJ	FJN	Web of Science	Scopus	Google Scholar
Overlay at outset								
RR:C19	2020	- 2020 Reviews	2692-4072					
JMIRx Med	2019	2019	2563-6316					
JMIRx Bio	2019	-						
JMIRx Psy	2019	-						
ST-Open	2018	2020	2718-3734					
JOSE	2018	2018	2577-3569					
JOSS	2016	2016	2475-9066	✓				✓
ReScience C	2015	2015	2430-3658	✓				
SIGMA	2005	2005	1815-0659	✓	✓	✓	✓	✓
Scholastica								
Ars Inveniendi Analytica	2020	2021	2769-8505					
MELBA Journal	2020	2020	2766-905X					
Compositionality	2019	2019	2631-4444					
Advances in Combinatorics	2018	2019	2517-5599	✓	✓		✓	
NBDT	2018	2018	2690-2664	✓				
Quantum	2017	2017	2521-327X	✓	✓	✓	✓	✓
Discrete Analysis	2016	2016	2397-3129	✓	✓	✓	✓	
OJA	2016	2016	2565-6120	✓	✓			
Episciences								
TheoretiCS	2021	-						
MOS	2021	2021	2804-8598					
JTCAM	2020	2021	2726-6141					
MNA	2020	2021	2801-0159					
EpiDEMES	2019	-						
JNSAO	2019	2019	2700-7448	✓				
Sociétés plurielles	2017	2017	2557-9959					
Slovo	2017	2017	2557-9851					
Epiga	2016	2017	2491-6765	✓	✓	✓	✓	
JIMIS	2016	2016	2430-3038					
JDMDH	2014	2014	2416-5999	✓				
LMCS	2004	2005	1860-5974	✓	✓	✓	✓	✓
ARIMA	2002	2002	1638-5713					
Switch to overlay								
eLife	2020	2022	2050-084X	✓		✓	✓	✓
Scholastica								
Internet Mathematics	2017	2017	1944-9488		✓		✓	
Episciences								
CM	2021	-	2336-1298	✓			✓	
JPE	2021	2021	1844-8208	✓		✓	✓	
OCNMP, formerly JNMP	2021	2021	2802-9356			✓	✓	✓
EID	2021	2021	2778-844X					
FI	2021	2021	1875-8681			✓	✓	✓
jGCC, formerly GCC	2020	2020	1869-6104			✓	✓	
HRJ	2014	2015	2804-7370					
DMTCS	2014	2015	1365-8050	✓	✓	✓	✓	✓
No longer overlay								
biOverlay (2020 closed)	2018	2018						
The Idealis (2019 closed)	2017	2017						
JIPS (2021 closed)	2008	2010	2418-1838					
G&T (2012[1])	1997	1997	1364-0380			✓	✓	✓
JHEP (2012[1])	1997	1997	1029-8479	✓		✓	✓	✓
[1](Priem & Hemminger 2012)								

Table 2: Journal-based Indexing and Metrics

Journal Title	2020 Clarivate Journal Citation Reports				2020 Scopus			2021 Google Scholar			
	Total Articles	Journal Impact Factor	Highest Rank (%ile)	Category	Cite-Score	Highest Rank (%ile)	Category	h5-index	h5-median	Rank (in top 20)	Subcategory
Overlay at outset											
JOSS (2016)								48	114		
SIGMA (2005)	146	1.072	38/55 (32)	Physics, Mathematical	1.4	39/94 (59)	Geometry and Topology	22	29	15	Mathematical Physics
Scholastica											
Advances in Combinatorics (2018)					0.6	67/85 (21)	Discrete Mathematics and Combinatorics				
Quantum (2017)	160	6.777	9/86 (90)	Physics, Multi-disciplinary	6.7	7/58 (88)	Physics and Astronomy (misc.)	47	59		
Discrete Analysis (2016)	19	n/a	-	-	3.5	7/109 (94)	Algebra and Number Theory				
Episciences											
Epiga (2016)	21	n/a	-	-	0.6	91/109 (16)	Algebra and Number Theory				
LMCS (2004)	77	0.438	15/21 (31)	Logic	1.8	116/226 (48)	General Computer Science	24	34	20	Theoretical Computer Science
Switch to overlay											
eLife (2020)	1,900	8.146	5/93 (95)	Biology	10.6	19/204 (90)	General Biochemistry, Genetics and Molecular Biology	137	182	11	Life Sciences & Earth Sciences (general)
Scholastica											
Internet Mathematics (2017)					1.6	320/548 (41)	Applied Mathematics				
Episciences											
CM (2021)					0.5	330/378 (12)	General Mathematics				
JPE (2021)	7	n/a			0.5	254/644 (60)	Philosophy				
OCNMP (2021); formerly JNMP	41	1.053	178/265 (33)	Mathematics, Applied	2.3	33/67 (51)	Mathematical Physics	14	16		
FI (2021)	116	1.333	140/265 (47)	Mathematics, Applied	3.1	11/109 (90)	Algebra and Number Theory	27	41	14	Theoretical Computer Science
jGCC (2020); formerly GCC	n/a	n/a			1.5	325/548 (40)	Applied Mathematics				
DMTCS (2014)	28	0.596	279/330 (15)	Mathematics	1.4	36/85 (58)	Discrete Mathematics and Combinatorics	14	19		
No longer overlay											
G&T (2012[1])	52	1.563	65/330 (80)	Mathematics	3.3	10/94 (89)	Geometry and Topology	36	52	2	Geometry
JHEP (2012[1])	2,321	5.810	5/29 (84)	Physics, Particles and Fields	10.1	5/75 (94)	Nuclear and High Energy Physics	157	217	1	High Energy & Nuclear Physics

%ile = percentile; misc. = miscellaneous; [1](Priem & Hemminger 2012)

Table 3: Journal-based Metrics from Clarivate (Web of Science), Scopus, and Google Scholar

58th percentile for "Discrete Mathematics and Combinatorics," 2020 JIF in the 15th percentile for "Mathematics," and 2021 h5-index of 14. The four other journals with 2020 CiteScore highest percentile greater than 50% were switched to overlay in 2020-2021, suggesting that journals with strong citation histories are choosing to become overlays. This included *Fundamenta Informaticae* (*FI*) (switched to overlay in 2021) with 2020 CiteScore in the 90th percentile for "Algebra and Number Theory," 2020 JIF in the 47th percentile for "Mathematics, Applied," and 2021 GS Metric rank of 14th for "Theoretical Computer Science." The two journals, *JHEP* and *G&T*, that were "No longer overlay" had 2020 JIF highest percentiles of 80% and greater, 2020 CiteScore highest percentiles of 89% and greater, and 2021 GS Metric ranks of 2nd or greater.

Article-based indexing and metrics considered whether the journal article could be found in GS and what features were offered by the journal (Table 4). Although journals themselves were not indexed in GS, articles from 36 of the 39 journals that have published at least one article could be found on GS. The arXiv preprint was listed as the source for *Ars Inveniendi Analytica* articles in GS despite having the journal website link to the full text article. For *RR:C19*, reviews were displayed. Journals using Episciences report so-called consultation statistics which are views and downloads (Table 4). *JOSS* and *JOSE* use Altmetric to report the social media attention for their articles. *JMIRx Med* uses Altmetric for social media attention and Dimensions for citation activity, in addition to separately providing citations from CrossRef and tweetations. The articles from when *JHEP* was an overlay have landing pages on an IOP website where downloads and Dimensions links are provided. For articles from when *G&T* was an overlay, lists of forward citations are provided. *Compositionality* and *Quantum* (two Scholastica journals) provide citation lists populated from CrossRef cited-by service and Smithsonian Astrophysical Observatory (SAO)/National Aeronautics and Space Administration (NASA) Astrophysics Data System (ADS). Views, downloads, and citation counts (polled highest count across CrossRef, PubMed Central, and Scopus) are provided for *eLife* articles, with the opportunity for reader comments. *RR:C19* also allows comments for its published reviews.

Discussion

Overlay journals can be divided into two groups when considering Evolution and Certification: historically conventional, overlooked journals and new, emergent journals. Conventional, overlooked overlay journals use arXiv or HAL, include author submitted content, and provide anonymized, private peer review. New, emergent overlay journals use bioRxiv, medRxiv, or GitHub, include journal selected content, and provide visible, public peer review.

Certification is an essential value-added service that an overlay journal provides to a preprint repository. With the rise of preprints, the need for certification is imperative. Interestingly, 65% of the preprints deposited in 2020 in medRxiv were COVID-19 related. In 2021, only 51% of the preprints deposited in medRxiv were COVID-19 related. The proportion of COVID-19 related preprints in arXiv and bioRxiv

Journal Title	Year Established	First Article	Google Scholar	views	downloads	citations	Dimensions	Altmetric	comments
Overlay at outset									
RR:C19	2020	- 2020 Reviews	✓ Reviews						✓ Reviews
JMIRx Med	2019	2019	✓			✓	✓	✓	
JMIRx Bio	2019	-							
JMIRx Psy	2019	-							
ST-Open	2018	2020	✓						
JOSE	2018	2018	✓					✓	
JOSS	2016	2016	✓					✓	
ReScience C	2015	2015	✓						
SIGMA	2005	2005	✓						
Scholastica									
Ars Inveniendi Analytica	2020	2021	*						
MELBA Journal	2020	2020	✓						
Compositionality	2019	2019	✓			✓			
Advances in Combinatorics	2018	2019	✓						
NBDT	2018	2018	✓						
Quantum	2017	2017	✓			✓			
Discrete Analysis	2016	2016	✓						
OJA	2016	2016	✓						
Episciences									
TheoretiCS	2021	-							
MOS	2021	2021	✓	✓	✓				
JTCAM	2020	2021	✓	✓	✓				
MNA	2020	2021	✓	✓	✓				
EpiDEMES	2019	-							
JNSAO	2019	2019	✓	✓	✓				
Sociétés plurielles	2017	2017	✓	✓	✓				
Slovo	2017	2017	✓	✓	✓				
Epiga	2016	2017	✓	✓	✓				
JIMIS	2016	2016	✓	✓	✓				
JDMDH	2014	2014	✓	✓	✓				
LMCS	2004	2005	✓	✓	✓				
ARIMA	2002	2002	✓	✓	✓				
Switch to overlay									
eLife	2020	2022	✓	✓	✓	✓			✓
Scholastica									
Internet Mathematics	2017	2017	✓						
Episciences									
CM	2021	-							
JPE	2021	2021	✓	✓	✓				
OCNMP, formerly JNMP	2021	2021	✓	✓	✓				
EID	2021	2021	✓	✓	✓				
FI	2021	2021	✓	✓	✓				
jGCC, formerly GCC	2020	2020	✓	✓	✓				
HRJ	2014	2015	✓	✓	✓				
DMTCS	2014	2015	✓	✓	✓				
No longer overlay									
biOverlay (2020 closed)	2018	2018							
The Idealis (2019 closed)	2017	2017							
JIPS (2021 closed)	2008	2010	✓	✓	✓				
G&T (2012[1])	1997	1997	✓			✓			
JHEP (2012[1])	1997	1997	✓		✓		✓		
[1](Priem & Hemminger 2012); *journal website link but arXiv preprint source									

Table 4: Article-based Indexing and Metrics

were similar when comparing 2020 and 2021, with 1% in arXiv and 6%-7% in bioRxiv. The most common peer review was anonymized, private peer review, typical of a conventional, overlooked overlay journal on arXiv. The next most common peer review was visible, public peer review, typical of a new, emergent overlay journal on bioRxiv or medRxiv. This shift to more open peer review may be related to the subject areas served by these repositories and/or pandemic-related preprints. The peer reviews from *RR:C19* and *JMIRx Med* are published with a DOI offering the peer reviewer the advantage of a citable work product.

With growing calls for "open science" and open review (Drury 2021; Tsakonas 2021), the hope is that it would allow for more prompt and transparent research communication in future models of scholarly communication. The number of overlay journals allowing, or originally intending to use "journal selected" works, such as *RR:C19, JMIRx* overlays, and *ST-Open*, has increased, resulting in potentially quicker reviews. While many overlays still use anonymized, private peer review, the number of journals allowing combinations of anonymized and visible and private and public reviews is also increasing, potentially moving towards a more "open" environment of increased collaboration and feedback. Such a space could provide more context for reviewers, leading to a better understanding of the work and its results (COAR n.d.; Drury 2021).

This openness can facilitate increased collaboration and input in research in certain contexts. For example, *ReScienceC, JOSE,* and *JOSS* use visible, public peer review in which reviewers/readers are encouraged to run code deposited in GitHub to identify errors or enhancements. There is an assumption that open reviews result in more "constructive" reviews (Drury 2021); however, visible reviews do not mean the quality of the review will increase. For example, anybody could review articles, even if they may not be the most qualified to do so. While there are contexts in which that fits, like *ST-Open*, a teaching journal using peer review as a learning opportunity, there is an understanding from the researcher as to who is doing the reviewing. When journals select articles without author input, there is not always an understanding of the qualifications of the reviewer, and, by extension, the quality of the review. Open peer review has expanded beyond the overlay journal into its own value-added service. As a result, certification tools and services, including automated screeners, such as SciScore and ODP Pub, and review aggregators, such as Sciety and Early Evidence Base, have grown (Drury 2021; Weissgerber et al. 2021). With these growing value-added review services, it may be difficult to determine the benefits (and potential issues) of overlays journals within scholarly communication.

Given the emergence of open peer review as an independent service, an overlay journal must offer value-added services beyond Certification or peer review to remain competitive. In addition to certification, overlays need to offer avenues to fulfill Awareness and Rewarding functions. Why would researchers choose to publish in overlays? Are overlays taking advantage of Awareness methods available to them? Journal- and article-based indexing and metrics were evaluated to determine the current state of overlays. Most overlays had ISSN numbers. Additionally, many choose membership in DOAJ and FJN. Even if indexing may not be as widely applied, authors interested in open access work would consult DOAJ and FJN. As well, a significant

number of journals have articles indexed in GS, although GS Metrics for the journal itself was only available for ten overlays. While having articles in GS is a pathway of discovery, the metrics (and hence rewarding) are limited when the journal has not produced at least 100 articles in the last five years. The maturity and productivity of overlays are issues for conventional journal-based metrics. That being said, *Advances in Combinatorics*, with the capable help of the Queen's University librarians, is listed in FJN, DOAJ, and Scopus (Matthews et al. 2019). As such, *Advances in Combinatorics* was able to receive a 2020 Scopus CiteScore (Table 3). Indexing provides a crucial opportunity for librarians and journals to collaborate, adding value to the overlay. Current scholarly communication rewarding practices encourage researchers to search for high impact factor journals (Ross-Hellauer et al. 2019). As many overlays are still relatively new, impact factors were not calculated. This will be a crucial trend to watch in the coming years. If overlays are not currently working on indexing, future rewarding systems will remain unattainable. As well, journals that switched to overlays from established, traditional journals, are still benefiting from past "prestige" through previous journal-based metrics. While the implications of the switch may not be seen for the next couple of years, these metrics help establish rewarding systems for the journal. However, as with overlays that began as overlays at the outset, indexing will have future implications on the journal's ability to maintain rewarding systems.

Article-based indexing and metrics, rather than journal-based indexing and metrics, are the measures of Awareness and Rewarding on which most new overlay journals must rely. While many overlays configured their article's websites to have the article indexed in GS, most are not taking advantage of opportunities to report views, downloads, citations, and comments or use services like Altmetric and Dimensions. For example, of the overlay journals providing information on citations, *eLife* provides citation counts only, *Compositionality*, *Quantum*, and *G&T* provide citation lists, and *JMIRx Med* provides citation lists and links to Dimensions. Having article-based metrics publicly available allows the authors to collate their own statistics. Interestingly, some overlay journals collate this information—like views and downloads for *ST-Open* which was shared in a publication (Gudelj et al. 2021), and citation counts for *The Open Journal of Astrophysics* which was shared in a blog post (Coles 2020)—but miss a significant opportunity for a rewarding value-add by not sharing this same information publicly on the article's website at the journal. This missed opportunity is not unique to the journals but also to the software platforms. While overlay journals on the Episciences platform consistently report views and downloads, citations are not reported. Of the overlay journals on the Scholastica platform, two offer citation lists only. Overlay journal software platforms should consider offering more robust article-based metrics. Nevertheless, a librarian advising an author about research impact must remind the author to collect article-based metrics from their article's journal website, their article's repository website, and GS's "cited by" option (if applicable), for maximum impact.

However, overlays have become an important Rewarding option for researchers seeking to publish without supporting traditional Article Processing Charge (APC) models, especially as such options are not traditionally available for all disciplines (Vianello 2021). As such, overlays can provide a means for researchers to publish their

work and receive credit, validated using persistent identifiers, like DOIs (COAR 2020). For example, *JOSS* publishes fully researched open-source software code that is a significant contribution (i.e., at least three months effort). There is an option to include an accompanying paper; however, there is an acknowledgement of the work in the code and significant amounts of additional time should not have to be spent on papers to gain "currency" (JOSS n.d.). Additionally, *JOSE* acknowledges that currently, in mainstream scholarly communication, there is no "mechanism" for rewarding efforts to develop open-source learning material (JOSE n.d.). *JOSE* provides rewarding opportunities for researchers and instructors, allowing them to gain credit with a DOI and exposure as part of *JOSE* journal.

Information professionals can play a critical role in the success of overlay journals. Librarians at Queen's University Library were pivotal not only in ensuring *Advances in Combinatorics* was indexed for maximum Awareness and Rewarding, but also in providing financial support. Likewise, University of Texas at Austin Libraries financially supports *Ars Inveniendi Analytica* (University of Texas at Austin 2021). Furthermore, *Ars Inveniendi Analytica* provided a unique opportunity for collaboration between the librarians at University of Texas at Austin and Harvard University, including developing journal policies, securing ISSN, and getting indexed to maximize discoverability (Lyon and Cressman 2021; University of Texas at Austin 2021). Librarians can also support the author-side of overlay journals through information literacy and research impact. Librarians can help authors collect journal- and article-based metrics, remembering that some article-based metrics may be available in multiple places. Librarians can make researchers aware that one advantage for authors submitting to an overlay journal is that their preprint is immediately discoverable, even while awaiting peer review. This advantage is a critical consideration given that a recent review of 171 major academic journals found that 39.2% had unclear information regarding whether or not a preprint could be posted to a repository (Klebel et al. 2020).

However, from an information literacy perspective, librarians and researchers need to be aware of unintended consequences. One concern is that, as journals select preprints, different versions of the same preprint could appear in multiple journals (Lab 2020; Vines 2019). How can an author prevent their work from an "unauthorized" journal reviewing it without the author's "consent?" How is it decided who gets the first pick for an article? One could argue that researchers implicitly give up the ability to gatekeep access to their articles when posting preprints in repositories, but the concern remains nonetheless. For researchers, overlay journals could provide increased discoverability earlier in the journal publication process; however, increased discoverability could have consequences if authors are looking to publish in different journals but a journal-selected overlay has already reviewed or "claimed" the preprint. To mitigate this and create consistent means of communication between repositories and overlay journals, in January 2021, COAR launched Notify: Repository and Services Interoperability Project (COAR 2021). In doing so, COAR Notify provides transparency and helps validate overlay journals as a viable indicator of quality research (COAR 2021). Notify creates pathways for many overlay/repository scenarios, including notifications for author requests for peer review and publishing, and notifications for

requests for peer review by repositories, as in journal selected article publications (COAR Notify, 2022).

While overlay journals provide a means of Certification, Awareness and Rewarding, are overlay journals sustainable into the future considering lessons learned from Status and Timeline? The motivation for overlay journals has been directly or indirectly attributed to the costs of traditional journals (Ball 2015; Conover 2016; Neumann 2010) or directly related to the volume of preprints in the current pandemic (Free 2020) (Figure 3, 4). The two 1997 journals switched from overlay to traditional because they were not self-sustaining, even with donations of volunteer time and funds (Fosmire 2013; Neumann 2010). New overlay journal software platforms support short-term viability, but the long-term sustainability is yet to be determined. As overlays evolve(d), the financial viability of overlay journals has increased, reducing operating costs when compared with the cost of traditional journals (Dawson 2021). There are also examples of increased collaboration between organizations and journals to support the financial viability of the overlay, such as Queen's University Library and *Advances in Combinatorics* (Queen's University Communications Staff 2018). Matthews et al. (2019) estimated the library costs (including the cost of Scholastica, domain name, and in-kind staff) for the overlay *Advances in Combinatorics* to be equivalent to the cost of an APC for a single article in a traditional journal, approximately US$2300 in 2018. *Ars Inveniendi Analytica* reported similar findings (Maggi, Valdinoci, and Cressman 2021). University of Texas at Austin Libraries financially supports *Ars Inveniendi Analytica* by covering the costs of Scholastica and the domain name (University of Texas at Austin 2021). While the overlay is more financially viable in comparison, the need for financial collaborations remains. Episciences is sponsored by the Institut national de recherche en sciences et technologies du numérique (INRIA) and Centre national de la recherche scientifique (CNRS) (OCNMP n.d.), which may explain the lack of financial collaboration at a journal level. In this research investigation, many overlay journals use Episciences, perhaps signaling a more financially sustainable option long-term.

Overlay journals continue to depend upon volunteer labour, which was problematic for the original overlays from 1997 (Fosmire 2013; Neumann 2010). While the hope is that new overlay software will lessen overall labour, some new overlays appear to have created more work for reviewers. For example, *eLife* requires reviewers to prepare comments for the public, in addition to detailed feedback for the authors. As well, only 20 journals use publishers. While perhaps signalling a difference in philosophies between traditional and overlay journals, this could be an area of increased instability for the overlay journal. The general editors of *Ars Inveniendi Analytica* note that lack of a publisher could have an impact on the journal's "activity" in the future (Maggi, Valdinoci, and Cressman 2021). *The Idealis*, starting in 2017, and *biOverlay*, starting in 2018, both ceased to be overlays after a couple of years. While *biOverlay* was an experiment that reached its end, a reason could not be found for *The Idealis*' end. However, both overlays were prototypes as they included journal selected content, which would require additional labour for the editors (in many cases) as they would then need to intentionally seek out and solicit material.

There is the "potential [for overlays] to form the backbone of a modern efficient and financially sustainable community driven publishing system" (Dawson 2021, 8).

Overlay journals are allowing community and collegial feedback, and collaboration across disciplines at a reasonable price (currently). For example, mathematics and physics have created an atmosphere of collegial sharing and critique using preprints and current research (Berthaud et al. 2014; Herman 2020). Similarly, *NBDT* selects works based on whether the editor would consider running a preprint as a "journal club paper for their own lab" (NBDT collective n.d.). Herman (2020) also argues that "there is an increasing scope for a number of new overlay journals to be developed, tailored for different research communities" (218).

However, scalability is a potential issue. While small scale publishing may be financially viable for either the journal or the supporting institutions, scaling up to thousands of articles a year not only has financial implications, but also logistical implications as increased overhead is required (Kulp and Ginsparg in Conover 2016). Such costs may prohibit the complete takeover of overlay journals as the only model of future scholarly communication. Additionally, many of the overlays in this study are still in their infancy and have not had the productivity required to receive conventional journal-based metrics. This will be a trend to watch over the next couple of years as the journals continue to publish new material. However, for more established overlays or ones that switched from traditional publishing structures to overlays, it remains to be seen if they can scale up.

Conclusion

With organizations, such as the Confederation of Open Access Repositories (COAR), arguing for overlays as the model of the future (COAR n.d.), it is important to be aware of the consequences of overlays, their emerging trends, and the opportunities for improved scholarly communication. Overlay journals are a relatively inexpensive way to certify and publish material. However, the use of overlay journals has implications, certainly for scholarly communications, but also for researchers and information professionals. Overlay journals have served to highlight the continued need for and importance of peer review, becoming a way to meet the fast-paced and quickly evolving information needs of individuals, especially during a global pandemic. For researchers, overlay journals can potentially provide increased discoverability earlier in the journal publication process and, in some cases, opportunities for rewarding; however, this increased discoverability could have potential consequences if authors are looking to publish in different journals, but a journal-selected overlay has already reviewed or "claimed" the preprint. Overlay journals can also potentially offer researchers a way to meet grant funder open access requirements and, in doing so, also provide a prompt and cost-effective publishing option with many options for discovery and visibility. For library and information professionals, overlay journals are a helpful way to evaluate the authority and legitimacy of rapidly developing information, while also offering rare opportunities for interlibrary collaborations. Overlays are an avenue for identifying timely and pertinent information to support the needs of information seekers in a time of growing information. Ultimately, whether overlooked or emergent, overlay journals appear to be here to stay and will be a scholarly communication trend worth monitoring into the future.

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1. arXiv advanced search: https://arxiv.org/search/advanced
2. bioRxiv advanced search: https://www.biorxiv.org/search

3. medRxiv advanced search: https://www.medrxiv.org/search
4. Covid-19 preprint search: https://icite.od.nih.gov/covid19/search/
5. Communications in Mathematics https://cm.episciences.org/
6. TheoretiCS https://theoretics.episciences.org/
7. The Journal of Philosophical Economics (JPE) https://jpe.episciences.org/
8. Management & Organisations du Sport (MOS) https://mos.episciences.org/
9. Open Communications in Nonlinear Mathematical Physics (OCNMP) https://ocnmp.episciences.org/
10. Environnement, ingénierie & développement (EID) https://eid.episciences.org/
11. Fundamenta Informaticae https://fi.episciences.org/
12. Rapid Reviews: COVID19 (RR:C19) https://rapidreviewscovid19.mitpress.mit.edu/
13. eLife https://elifesciences.org/
14. Journal of Theoretical, Computational and Applied Mechanics (JTCAM) https://jtcam.episciences.org/
15. Ars Inveniendi Analytica https://ars-inveniendi-analytica.com/
16. Mathematical Neuroscience and Applications (MNA) https://mna.episciences.org/
17. journal of Groups, Complexity, Cryptology https://gcc.episciences.org/
18. ST-Open http://st-open.unist.hr/index.php/st-open
19. Machine Learning for Biomedical Imaging (MELBA) Journal https://www.melba-journal.org/
20. Épijournal de Didactique et Epistémologie des Mathématiques pour l'Enseignement Supérieur (EpiDEMES) https://epidemes.episciences.org/
21. Compositionality https://compositionality-journal.org/
22. Journal of Nonsmooth Analysis and Optimization (JNSAO) https://jnsao.episciences.org/
23. JMIRx Med https://xmed.jmir.org/
24. JMIRx Bio https://bio.jmirx.org/
25. JMIRx Psy https://psy.jmirx.org/
26. Advances in Combinatorics https://www.advancesincombinatorics.com/
27. Neurons, Behavior, Data analysis and Theory (NBDT) https://nbdt.scholasticahq.com/
28. Journal of Open Source Education (JOSE) https://jose.theoj.org/
29. biOverlay https://www.bioverlay.org/
30. Sociétés plurielles/Plural Societies https://societes-plurielles.episciences.org/
31. Internet Mathematics https://www.internetmathematicsjournal.com/
32. Quantum https://quantum-journal.org/
33. Slovo https://slovo.episciences.org/
34. Épijournal de Géométrie Algébrique (Epiga) https://epiga.episciences.org/
35. Journal of Open Source Software (JOSS) https://joss.theoj.org/
36. Discrete Analysis https://discreteanalysisjournal.com/
37. The Open Journal of Astrophysics https://astro.theoj.org/
38. Journal of Interdisciplinary Methodologies and Issues in Science (JIMIS) https://jimis.episciences.org/
39. ReScience C https://rescience.github.io/

40. Hardy-Ramanujan Journal https://hrj.episciences.org/
41. Discrete Mathematics & Theoretical Computer Science (DMTCS) https://dmtcs.episciences.org/
42. Journal of Data Mining and Digital Humanities (JDMDH) https://jdmdh.episciences.org/
43. Journal d'Interaction Personne-Systéme (JIPS) https://jips.episciences.org/
44. Symmetry, Integrability and Geometry: Methods and Applications (SIGMA) https://www.emis.de/journals/SIGMA/
45. Logical Methods in Computer Science (LMCS) https://lmcs.episciences.org/
46. African Journal of Research in Computer Science and Applied Mathematics (ARIMA) https://arima.episciences.org/
47. Geometry and Topology (G&T) https://msp.org/gt/about/journal/about.html
48. Journal of High Energy Physics (JHEP) https://jhep.sissa.it/jhep/index.jsp

Appendix 1: Detailed Overlay Journal Structure

Journal Title	Year Established as Overlay	First Article as Overlay	Preprint Repository	Licence	Content Acquisition	Peer Review	Software Platform	Publisher	Support	Associated Fees
Communications in Mathematics (CM)[1]	[2021] (switch to overlay)	--	arXiv		Author submitted	Anonymized/ Private	Episciences			None for author
TheoretiCS	[2021]	--	arXiv CoRR	CC licencing	Author submitted	Anonymized/ Private	Episciences	TheoretiCS Foundation e.V.	CCSD	None for author
The Journal of Philosophical Economics (JPE)	2021 (switch to overlay)	2021	HAL	CC BY - NC - SA	Author submitted	Anonymized/ Private	Episciences	Editura ASE		None for author
Management & Organisations du Sport (MOS)	2021	2021	HAL		Author submitted	Anonymized/ Private	Episciences	Société Savante de Management du Sport (S2MS)		None for author
Open Communications in Nonlinear Mathematical Physics (OCNMP)[2]	2021 (switch to overlay)	2021	arXiv, HAL	CC BY	Author submitted	Anonymized/ Private	Episciences			None for author
Environnement, ingénierie & développement (EID)[3]	2021 (switch to overlay)	2021	HAL	CC BY	Author submitted	Anonymized/ Private	Episciences			None for author
Fundamenta Informaticae (FI)	2021 (switch to overlay)	2021	arXiv CoRR		Author submitted	Anonymized/ Private	Episciences	Polish Mathematical Society		Not stated
Rapid Reviews: COVID19 (RR:C19)	2020	– 2020 Reviews	medRxiv, bioRxiv, PsyArXiv, SSRN, other repositories (not listed)	CC BY 4.0 - Reviews	Journal selected COVID-Scholar	Visible/ Public Review has DOI	PubPub from Knowledge Futures Group (MIT)	MIT Press	Patrick J. McGovern Foundation	Not stated
eLife	2020 (switch to overlay)	2021	bioRxiv, medRxiv	CC BY 4.0	Author submitted	Output 1 Anonymized/ Private; Visible/ Private Output 2 Anonymized/ Public; Visible/ Public		eLife Sciences Publications, Ltd.	Howard Hughes Medical Institute, the Knut and Alice Wallenberg Foundation, the Max Planck Society, Wellcome	US$3000 author-paid publication fee
Journal of Theoretical, Computational and Applied Mechanics (JTCAM)	2020	2021	arXiv, HAL	CC BY	Author submitted	Anonymized/ Private; Visible/ Private	Episciences		Mecamat, CCSD, INRIA, Loomio Cooperative Limited	None for author
Ars Inveniendi Analytica	2020	2021	arXiv	CC BY 4.0	Author submitted	Anonymized/ Private	Scholastica		University of Texas at Austin	None for author; US$10 per article[4]
Mathematical Neuroscience and Applications (MNA)	2020	2021	arXiv, HAL	CC BY 4.0	Author submitted	Anonymized/ Private	Episciences			None for author

journal of Groups, Complexity, Cryptology (jGCC)[5]	2020 (switch to overlay)	2020	arXiv, HAL	CC BY 4.0	Author submitted	Visible/ Private	Episciences	jGCC Editorial Board		None for author
Machine Learning for Biomedical Imaging (MELBA) Journal	2020	2020	arXiv	CC licencing	Author submitted	Anonymized/ Private	Scholastica			Not stated; US$10 per article[4]
Épijournal de Didactique et Epistémologie des Mathématiques pour l'Enseignement Supérieur (EpiDEMES)	2019	–	arXiv, HAL	CC BY - SA	Author submitted	Anonymized/ Private	Episciences		CCSD	None for author
Compositionality	2019	2019	arXiv		Author submitted	Output 1 Anonymized/ Private; Visible/ Private Output 2 Anonymized/ Public; Visible/ Public	Scholastica, O-3PO WordPress Plug-in	Composition-ality	Ilyas Khan, Quantum, Johannes Drever, Christian Gogolin	None for author
Journal of Nonsmooth Analysis and Optimization (JNSAO)	2019	2020	arXiv, HAL	CC licencing	Author submitted	Anonymized/ Private	Episciences	JNSAO Editorial Board		None for author
JMIRx Med	2019	2020	medRxiv	CC BY - articles and reviews; CC0 - images	Author submitted; Journal selected	Visible/ Public Review has DOI		JMIR		None for author
JMIRx Bio	2019	–	bioRxiv	CC BY - articles and reviews; CC0 - images	Author submitted; Journal selected	Visible/ Public Review has DOI		JMIR		None for author
JMIRx Psy	2019	–	PsyArXiv	CC BY - articles and reviews; CC0 - images	Author submitted; Journal selected	Visible/ Public Review has DOI		JMIR		None for author
ST-Open	2018	2020	University of Split repository, DABAR, other Croatian university repositories	CC BY 4.0	Author submitted; Journal selected	Anonymized/ Private; Visible/ Private	OJS/PKP	University of Split		None for author
Advances in Combinatorics	2018	2019	arXiv	CC BY	Author submitted	Anonymized/ Private	Scholastica	Alliance of Diamond Open Access Journals	Queen's University Library	None for author; US$10 per article[4]
Neurons, Behavior, Data analysis and Theory (NBDT)	2018	2018	arXiv	CC BY	Author submitted	Anonymized/ Private; Anonymized/ Public	Scholastica	The neurons, behavior, data analysis and theory collective		None for author; US$10 per article[4]

Journal of Open Source Education (JOSE)	2018	2018	GitHub	CC BY 4.0, MIT licence, and OSI licencing	Author submitted	Visible/ Public	Sphinx			None for author
biOverlay	2018 2020 closed	2018	not listed	CC BY - reviews	Journal selected	Anonymized/ Public; Visible/ Public			Gordon and Betty Moore Foundation	
Sociétés plurielles/ Plural Societies	2017	2017	HAL	CC licencing	Author submitted	Anonymized/ Private	Episciences			None for author
The Idealis[6]	2017 2019 closed	2017			Journal selected		WordPress; Press-Forward			
Internet Mathematics	2017 (switch to overlay)	2017	arXiv	CC BY licencing	Author submitted	Anonymized/ Private	Scholastica			None for the author
Quantum	2017	2017	arXiv	CC BY 4.0	Author submitted	Anonymized/ Private	Scholastica			Author paid publication fees: regular €450, discounted €100, or waived €0; Quantum pays US$10 per article[4]
Slovo	2017	2017	HAL	CC licencing	Author submitted	Anonymized/ Private	Episciences			None for author
Épijournal de Géométrie Algébrique (Epiga)	2016	2017	arXiv, HAL	CC BY - SA	Author submitted	Anonymized/ Private	Episciences		CCSD	None for author
Journal of Open Source Software (JOSS)	2016	2016	GitHub	CC BY 4.0, MIT licence, and OSI licencing	Author submitted	Visible/ Public	Sphinx			None for author
Discrete Analysis	2016	2016	arXiv	CC BY	Author submitted	Anonymized/ Private	Scholastica	Alliance of Diamond Open Access Journals	Cambridge University and Stanhill Foundation	None for author; US$10 per article[4]
The Open Journal of Astrophysics (OJA)	2016	2016	arXiv	CC BY	Author submitted	Anonymized/ Private	Scholastica	Maynooth Academic Publishing	Gordon and Betty Moore Foundation	None for author; US$10 per article[4]
Journal of Inter-disciplinary Methodologies and Issues in Science (JIMIS)	2016	2016	arXiv, HAL	CC licencing	Author submitted	Anonymized/ Private	Episciences		UMR ESPACE 7300 (CNRS, Université d'Avignon et des Pays de Vaucluse), CCSD, (S)FR Agorantic	Not stated
ReScience C	2015	2015	Zenodo, GitHub	CC BY	Author submitted	Visible/ Public	GitHub			None for author
Hardy-Ramanujan Journal (HRJ)[7]	2014 (switch to overlay)	2015	arXiv, HAL	CC licencing	Author submitted	Anonymized/ Private	Episciences			Not stated

Discrete Mathematics & Theoretical Computer Science (DMTCS)	2014[8] (switch to overlay)	2015	arXiv, HAL	CC BY 4.0	Author submitted	Anonymized/ Private	Episciences	Discrete Mathematics and Theoretical Computer Science (DMTCS)	Inria	None for author
Journal of Data Mining and Digital Humanities (JDMDH)	2014	2014	arXiv, HAL, CWI, PRODINRA	CC BY 4.0	Author submitted	Anonymized/ Private	Episciences		INRA, Inria, CNRS	None for author
Journal d'Interaction Personne-Système (JIPS)	2008 2021 closed	2010	arXiv, HAL, CWI	CC BY 2.0	Author submitted	Anonymized/ Private	Episciences as of 2014[8]	Franco-phone Association for Human-Computer Interaction (AFIHM)		None for author
Symmetry, Integrability and Geometry: Methods and Applications (SIGMA)	2005	2005	arXiv	CC BY - SA	Author submitted	Anonymized/ Private			Foundation Compositio Mathematica, University Library of Radboud University Nijmegen, Sociedad Mexicana de Física, University Libraries of the Delft University of Technology and Uppsala University	None for author
Logical Methods in Computer Science (LMCS)	2004	2005	arXiv CoRR	CC licencing	Author submitted	Anonymized/ Private	Episciences as of 2014[8]	Logical Methods in Computer Science e.V.		None for author
African Journal of Research in Computer Science and Applied Mathematics (ARIMA)	2002	2002	HAL	CC licencing	Author submitted	Anonymized/ Private	Episciences as of 2014[8]			Not stated
Geometry and Topology (G&T)	1997 2012[9] no longer overlay	1997 1997-2007 on arXiv	arXiv	1997-2005 copyright Geometry & Topology Publications 2006-2007 no copyright statement	Author submitted	Anonymized/ Private				

Journal of High Energy Physics (JHEP)	1997 2012[9] no longer overlay	1997	arXiv	1997-2002 no copyright statement 2002-2006 copyright SISSA / ISAS 2007-2009 copyright SISSA	Author submitted	Anonymized/ Private	developed by SISSA	2002-2009 Institute of Physics (IOP) Publishing		

Journal Title hyperlinked and URL provided in URL List after References.
[1] Formerly *Acta Mathematica et Informatica Universitatis Ostraviensis* (1993-2003) and *Acta Mathematica Universitatis Ostraviensis* (2003–2009).
[2] Formerly *Journal of Nonlinear Mathematical Physics* (JNMP).
[3] Formerly *Déchets Sciences & Techniques* (DST).
[4] (Ball 2015; Conover 2016)
[5] Formerly *Groups, Complexity, and Cryptology* (GCC).
[6] (Troia 2017)
[7] Formerly *Hardy-Ramanujan Journal: A Journal devoted to primes, diophantine equations, transcendental numbers and other questions on 1, 2, 3, 4, 5, . . .*
[8] (Berthaud et al. 2014)
[9] (Priem & Hemminger 2012)