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Counting the Cost: A Report on APC-Supported Open Access Publishing in a Research Library

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BACKGROUND At one-hundred twenty-two articles published, the open access journal *Tremor and Other Hyperkinetic Movements (Tremor)* is growing its readership and expanding its influence among patients, clinicians, researchers, and the general public interested in issues of non-Parkinsonian tremor disorders. Among the characteristics that set the journal apart from similar publications, *Tremor* is published in partnership with the library-based publications program at Columbia University's Center for Digital Research and Scholarship (CDRS). **DESCRIPTION OF PROGRAM** The production of *Tremor* in conjunction with its editor, a researching faculty member, clinician, and epidemiologist at the Columbia University Medical Center, has pioneered several new workflows at CDRS: article-charge processing, coordination of vendor services, integration into PubMed Central, administration of publication scholarships granted through a patient-advocacy organization, and open source platform development among them. Open access publishing ventures in libraries often strive for lean operations by attempting to capitalize on the scholarly impact available through the

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use of templated and turnkey publication systems. For CDRS, production on *Tremor* has provided opportunity to build operational capacity for more involved publication needs. The following report introduces a framework and account of the costs of producing such a publication as a guide to library and other non-traditional publishing operations interested in gauging the necessary investments. Following a review of the literature published to date on the costs of open access publishing and of the practice of journal publishing in academic libraries, the authors present a brief history of *Tremor* and a tabulation of the costs and expenditure of effort by library staff in production. **NEXT STEPS** Although producing *Tremor* has been more expensive than other partner publications in the center's portfolio, the experiences have improved the library's capacity for addressing more challenging projects, and developments for *Tremor* have already begun to be applied to other journals.

INTRODUCTION

Tremor and Other Hyperkinetic Movements (Tremor), a peer-reviewed, open-access medical journal publishing original research, case studies, and reviews on non-Parkinsonian tremor disorders, is produced at the Columbia University Libraries/Information Services (CUL/IS) through the publications partnership program developed at the Center for Digital Research and Scholarship (CDRS) (Maughan Perry, Borchert, Deliyannides, Kosavic, & Kennison, 2011). Among peer publications, *Tremor* is unique both for its affiliation with a library-based publishing program as well as for its business model: open access content (both *libre* and *gratis*) supported through article processing chargebacks to authors. Since its launch in 2011, *Tremor* has experienced escalation in growth, reputation, and supporting services through the partnership between CDRS, which handles journal production, and the journal's editor-in-chief, who executes editorial oversight in connection with *Tremor's* editorial board. At one-hundred twenty-two articles published, *Tremor* is a qualified success in the eyes of these partners. At the outset, the partners leaned heavily on their collective experiences to establish baselines for production workflow efficiency and APC price points. In the years since, much real-world data on the allocation of personnel and costs of production have become available. The experience has proved instructive and speaks to the increasing potential of scholarly publishing programs in research libraries, particularly at CDRS. An examination of the monetary expenditures and personnel investments made in realizing that potential answers implicit questions about the costs of those advancements.

LITERATURE REVIEW

There is a significant amount of literature written on open access (OA) journal publication, including work that focuses on OA models that employ article processing charges (APCs)

to finance publication. OA journals are most prominent in the science, technology, and medicine (STM) fields, where they are most commonly funded by APCs (Solomon & Björk, 2012). In 2010, Björk et al. found that within these particular fields, “The weighted average OA availability over all [STM] disciplines was 20.4%” (p. 6). Among life sciences journals, gold OA (immediate, free access to a publication) is more prevalent than green OA publishing (self-archiving a version of a manuscript). Solomon and Björk (2012) report that in 2011 there were a total of 1,825 journals in the cross-disciplinary OA journal index DOAJ charging APCs, better than 26% of journals indexed there. Of the journals studied, the largest number of them charged APCs in the \$601-\$800 range. Solomon and Björk also found that universities in general have a lower article processing charge (\$461 USD on average) as opposed to commercial publishers. The range of APCs is vast; they “...vary quite dramatically...” from \$800 for certain Hindawi publications, to \$5,000 for *Cell Reports* (both OA) (Mangiafico & Smith, 2014, p. 225).

APCs are just one option in a broad landscape of publication funding models. Lack of transparency of publisher costs, however, has prevented a general consensus on the expense of producing a journal. As Van Noorden (2013) notes: for-profit journals are “...even less transparent about their costs than their open-access counterparts. Most declined to reveal prices or costs when interviewed for [Van Noorden’s] article” (p. 427). Nevertheless, attempts to understand and evaluate publishing costs have been made many times, mostly by utilizing rough estimates. In his analysis of costs incurred in creating and maintaining a peer-reviewed journal, Clarke (2007) created a framework to categorize and monetize necessary tasks—from receipt of a manuscript to publication (focused mainly on electronic tools and dissemination). Clarke’s cost model consists of Establishment costs, Operations costs (submissions-related, article-related, and generic costs), Infrastructure Maintenance, and Financial Aspects. Clarke also makes the distinction between fixed and variable costs: fixed costs are ongoing and “...are associated with the creation, existence and sustenance of an operation, and are independent of the volume of production,” whereas variable costs relate to volume (of submissions, of accepted papers, of published papers, etc). Using these components he estimated costs for set-up and maintenance of an online journal in various scenarios (not-for-profit publishers, for-profit publishers, among others). Using a per article APC of \$730 Clarke estimated it would cost \$22,000 per year to run an OA journal. Hovav and Gray (2001) reported on a case study which set out to analyze the fee and management structure of six ejournals. While none of the journals studied utilized APCs as a supplemental source of revenue, the range of cost to produce ejournals ranged from “minimal, voluntary” to “\$25,000” per year (Hovav & Gray, 2001, p. 756). King (2007) estimated that “...the average fixed cost to publish an article would be \$3,000 per article,” (p. 92) which would essentially just cover fixed costs and not take into account

variable costs, which he notes “...are affected by the size of an organization, inefficiencies, and R&D capabilities” (p. 90). Hedlund, Gustafsson, and Björk (2004) surveyed editors of open access scientific journals in an attempt to understand the cost structure based on either direct publishing costs or time estimates for task completion related to publication. Using a time-as-cost model, they came to the conclusion that about 163 hours are spent per year on tasks such as administration, IT-infrastructure, planning issues, and marketing to authors and readers. This figure reflects hours spent on an already established journal, where set-up and establishment efforts have already been completed. Further, Hedlund et al. surveyed editors who, in many cases, likely deal more closely with content-related duties and less with the administration and operation of the technological infrastructure and/or other publication management tasks. Included in publication management tasks is the oversight and coordination of post-acceptance manuscript preparation, whether this work is accomplished in-house or through a vendor. As Solomon and Björk (2012) found, a large portion of smaller-scale OA publishers make the decision to contract outside vendors for operations like copyediting and typesetting, most often because the capability to do so in-house is not available (Solomon & Björk 2012). This necessarily adds another direct cost associated with publication for those smaller or newer publishing ventures that do not have the staff or capability to perform copyediting and typesetting.

Library-based publishing operations often do not have the capability to take on the task of copyediting and typesetting for the reasons mentioned above. In many cases these operations support open access to research produced at the institution. In their article “Libraries as Journal Publishers,” (2011) Maughan Perry, Borchert, Deliyannides, Kosavic, and Kennison discuss the different roles that libraries can and do play in the creation and support of scholarly journals beyond publication: increasing discoverability of content; advising on author rights, author agreements, and licensing options such as Creative Commons; ISSN registration; DOI assignment; software services and support; formulation of outreach strategies; and training of editorial staff on publication platform. Many of these tasks taken on by library publishing operations to support OA publications are uniquely relevant to libraries (functioning as journal publishers) because, by definition, libraries are “mission driven, rather than market driven, [are] strong supporters of intellectual freedom, and [are] opponents of censorship and other restrictions on access to knowledge” (Mangiafico & Smith, 2014, p. 222). In 2008 Karla Hahn surveyed the member institutions of the Association of Research Libraries to gauge the level of involvement or interest in library-based publishing. Of the 80 libraries surveyed, 44% were actively involved in library publishing at the time of the survey, and 21% were in the planning phases of beginning such a program (Hahn, 2008). Mullins et al. (2012) also surveyed libraries to better understand the current landscape of libraries that publish academic journals. Of the 43 large research libraries surveyed, 55%

were either involved in, or interested and willing to become involved in, journal publication support, and “About three-quarters of the programs publish between one and six journals, the majority of which are only distributed electronically and are less than three-years old” (p. 6). York University’s library publishing operation is one such venture that exceeds these reported numbers; as of 2010 the York Digital Journals (YDJ) program was publishing 18 journals after about 4 years of existence. The YDJ project benefitted from native library infrastructure; the University landscape was crucial to the early success of the operation because it provided the journals program with “...multiple layers of support from library and university administration, as well as faculty members, librarian mentors, and library computing services” (Kosavic, 2010, p. 313). More recently, a survey conducted by the Library Publishing Coalition (LPC) project yielded 110 institutional responses and data on 565 published journals, most of which were faculty-driven. Similar to YDJ, 90% of libraries responding to the LPC survey rely (in part or totally) on “...their library’s operating budget to support publishing services” (Library Publishing Coalition, 2013, p. xi).

Also like the YDJ, many library-based (and commercial) publishing operations rely on freely available, open source software, such as Open Journal Systems (OJS), as a publishing platform (Figure 1). OJS is “...a robust, standards-based, publication-management system for scholarly journals, providing editorial workflow management, online article access, full-text searching, and interactive reading tools” (Devakos, 2007, p. 17).

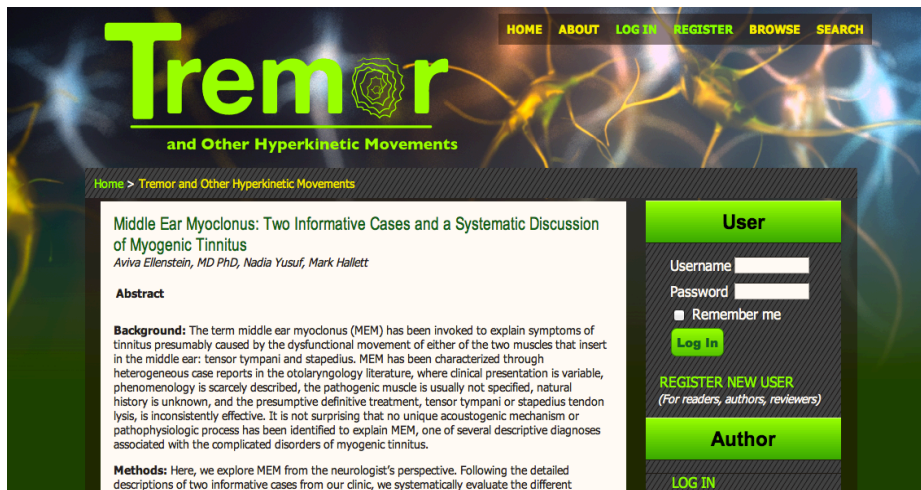


Figure 1. Sample article page for *Tremor and Other Hyperkinetic Movements* running on a customized installation of Open Journal Systems. <http://www.tremorjournal.org/index.php/tremor/article/view/103>

Of the libraries surveyed for the research report “Library Publishing Services: Strategies for Success,” 57% used OJS for electronic publication (Mullins et al., 2012). These numbers are consistent with the findings of Hahn’s 2008 ARL report, which found that more than half (about 55%) of the surveyed libraries active in scholarly publishing utilized OJS (Hahn, 2008). The LPC’s directory reported that 45% of surveyed libraries utilized OJS; it was the most common platform among respondents (Library Publishing Coalition, 2013). While this software is open source and free to use and build upon, there are often “... some considerable recurrent costs [...] involved in the development and operation of the publisher’s online access systems” (Houghton et al., 2009, p. 57). This tends to include multiple rounds of customizations and continual updates to the system, as recorded by Clarke (2007) who incorporates into the cost of publishing an electronic journal “... sustaining the technical infrastructure and the intellectual infrastructure on which the journal’s operation depends.” As Kosavic (2010) discovered with the YDJ project, the use of Open Journal Systems is often not just a straight-forward install, requiring staff to perform necessary upkeep. After the initial set up, the faculty at York University “...began to ask for added functionality and to request customizations to the software, which resulted in the need for programming time” (p. 314).

In addition to customizing the OJS interface to meet publishing goals, libraries have made concerted efforts to utilize available technology to further support mission-related goals: acknowledging preservation as a function of scholarly publishing, and ensuring long term, permanent archival storage of and access to published content. These principles are oftentimes manifested in the form of institutional repositories (IRs). Many IRs run on DSpace, an open source software application that can be used to create an ‘out of the box’ install, a highly customized digital repository, or something in between. Hahn (2008) found DSpace to be the second-most utilized software program that libraries used to support their publishing services (behind OJS). These findings were echoed by Mullins et al. (2012) who also found DSpace to be second to OJS for library publishing purposes, at 36%. As Houghton et al. (2009) observed:

Enabling and supporting self-archiving through the operation of institutional repositories offers a number of potential benefits for universities and research institutions, not only through providing greater support to research, but also in providing a platform for hosting and showcasing the institutions research and maintaining a more complete record of it... (p. xxiv)

In addition to institutional repositories, which house a broad range of disciplines, subject-specific repositories exist to aggregate content into discipline specific pools of information for potential researchers. PubMed Central (PMC) fills this role for life sciences journals;

when studying OA scientific literature Björk et al. (2010) found PMC to be the most frequently encountered subject based repository, along with arXiv. Standards for inclusion in a repository vary. Within PMC, once a publication is accepted for inclusion there are certain requirements that must be met in order for each article to be properly ingested into the system, like the “...conversion of submitted material into highly structured and tagged ASCII text” (Fisher, 2008). Fisher (2008) cites this work to make content fit for inclusion in PMC as an added cost of publication that can be, and often is, accommodated through outsourcing copyediting and typesetting to a vendor that understands the nuances behind “[m]ore complex document tagging definitions (such as the US National Library of Medicine DTD).”

REPORT FRAMEWORK

The following sections of the report provide a framework for considering the costs of publishing *Tremor* at CDRS—first, through an examination of the categories of personnel assembled for the journal production and subsequently through a review of the journal production components and effort estimates of personnel in each component. The report reviews costs both (1) as a measure of staff time to conduct work in the components and (2) as a balance sheet of revenues against expenses, and these may be found under the *Project Activity Report* and *Accounting Summary* sections respectively. A number of compromises were sought to bring some uniformity to data analysis and presentation, and a brief description of and rationale for these appear here:

- Both the project components and the personnel categories presented in this report reduce complexity of the data to provide a useful framework for discussion. Every effort has been made to faithfully recount events and account for time spent, yet the overall picture has been reassembled and estimated from historical data sources (e.g., email, invoices, internal reports).
- Some of this reduction has led to the presentation of categories with blurry boundaries. As will be seen, individual staff members occupy roles in multiple personnel categories. In turn, similar production activities occur in multiple project components. Explanation is provided in the corresponding descriptions to improve clarity.
- All effort expenditures reported by CDRS staff are production (read: not editorial) allocations. Therefore, in addition to all data presented here are the investments of effort in editorial preparation by the *Tremor* editor-in-chief, the reviews editor, and the editorial board. Effort in conducting peer-review management and of editorial

time spent in dialogue with project constituents is thus excluded.

- Among the platform customizations, the development of an OJS plugin to manage communication and transfer of data between the OJS and an external vendor was especially resource-intensive, owing to a number of factors that include staff turnover and ramp-up of internal expertise in OJS development conventions. With the benefit of hindsight, CDRS staff would likely pursue a different path to achieve similar results, but the impact of these efforts on the totals nevertheless appear in the data reported.
- An earlier account of the costs in developing *Tremor* was reported at the 2013 PKP Scholarly Publishing conference in Mexico City (Newton & Morris, 2013). Whereas the numbers provided here differ, this present work provides a new framework for examining the costs and represents an even greater investment in arriving at an accurate report.
- The dip in number of work hours for library staff in 2012 results not only from a greater maturity and realized efficiency of the journal project but also from a temporary reduction in overall staff at CDRS, which required a reduction of time across all projects to meet prioritized deadlines.
- CDRS' approach to open source software development and customization has advanced significantly since the project's inception. Technical debt incurred from early decisions to modify core OJS application code would be averted, given the current preference for a modular development approach and plugin-based architecture.

PROJECT ACTIVITY REPORT

Personnel Categories

The history of the *Tremor* project can be reviewed as a series of overlapping project components, each attended to by one or more members of the library staff. The project components presented in this paper place these staff into broader personnel categories to consolidate the discussion of their work, and these categories are described in further detail in the following sections: *Project Management*; *Production*; *Systems Administration*; *Finance*; and *Communications*. Please see also Figure 2 (following page), which presents a comprehensive view of all of the staff described in this paper, with their corresponding personnel categories.

Project Management

Staff in the planning and project management category perform the following and similar duties: manage production schedules, establish editorial partner meetings and agendas, review and coordinate vendor deliverables [both to the journal site and to PubMed Central

Personnel Categories (# Titles)	Titles
Project Management (9)	Director, CDRS Director, Copyright Advisory Office Usability Head Research Data Manager Production Manager Senior Project Manager Project Coordinator Production Assistant Work Study
Production (12)	Senior Project Manager Project Coordinator Production Assistant Web Developer Junior Web Developer Senior Application Developer Video Manager Video Producer Work Study Digital Repository Assistant CDRS Intern Health Sciences Librarian
Systems Administration (1)	Senior Systems Engineer
Finance (3)	Associate Vice President Business Manager Administrative Assistant VIII
Communications (2)	Communications Coordinator Work Study

Figure 2. Staff with corresponding personnel categories. Represented are 22 titles and around 33 people total (accounting for turnover) over the course of the project. Some titles span multiple categories as seen above.

(PMC)], schedule staff time for maintenance and new development work, and report on all progress through to CDRS administration.

There have been a number of CDRS personnel devoted to planning and project management. Near the project's outset, the director and the production manager were heavily involved in establishing the project's priorities and deliverables. As the project matured, these duties were handled in turn by the senior project manager and then subsequently her deputy, the project coordinator. Other associated library staff who have participated in a consultative role in project planning meetings were considered for this category, and we therefore add also the director of the Copyright Advisory Office, who provided essential insights related to author agreements and content licensing. The head of usability (now a vacant position) also played an early key role in site assessment and information architecture development, here grouped among Project Management duties.

Production

Production across CDRS projects is largely a technical function with programming staff working on open-source and locally developed applications to achieve a range of desired outcomes elicited from project partners. From the outset, CDRS staff and the *Tremor* editor-in-chief wanted to put the journal on an open source publishing platform to ensure a measure of ongoing customization and flexibility. As is done on the majority of its other publishing projects, a CDRS Web developer was tasked by Project Management with the primary responsibility of setting up, developing, and maintaining the *Tremor* codebase. None of the center's projects employ a strictly 1:1 relationship between staff and codebase, however. Instead, CDRS developers work in a collaborative environment, submitting and merging code into common repositories, and the efforts of the senior application developer at CDRS were eventually brought in to the project for the purposes of increased development throughput, maintenance backup, and general problem-solving efficiency.

Journal production, however, also includes a significant number of non-technical tasks related to the preparation, quality checking, and publication of original content (both text and multimedia on the journal Web site and elsewhere). Several staff involved in project management also assume production related duties—namely, the senior project manager and the project coordinator. Add to these the position of the production assistant (a versatile member of the staff who works across many of the center's teams) and the digital repository assistant (who ensures *Tremor* content is properly represented in Columbia's digital research repository, Academic Commons).¹

¹ See bit.ly/TremorJournalInAC for all *Tremor* content in Columbia's repository

Systems Administration

To set up new project Web sites, CDRS staff work with the library's local IT unit to arrange access to servers, to establish development, testing, staging, and production Web environments, to secure access to cloud-based source code repositories, and to configure and compile various essential platform components. Systems Administration, therefore, includes the group of library staff managing these activities and ensuring the uptime of core infrastructure. CDRS and its staff have remained the application owners throughout the project life, however, and the maintenance of any code remains the responsibility of the Production personnel. The Senior Systems Administrator of the Library Information Technology Office, with the assistance of junior staff, comprise the Systems Administration category. Personnel from both Production and Project Management liaise with Systems Administration personnel directly.

Finance

The library's finance office conducts essential business on behalf of the journal, namely the processing of APC payments, the payment of invoices received for production activities, and the management of *Tremor* accounts through the university-wide accounting system. Finance personnel include an Administrative Assistant and a Business Manager as well as the library administrator to whom they report.

Communications

The CDRS Communications Coordinator is another core member of the *Tremor* team, with duties that include preparation and distribution of messages to existing and potential readership. Development of mailing lists, assistance in writing periodic promotional copy, social media engagement, and readership analytics analyses reside among the responsibilities captured here. Communications may draw upon the availability of student assistance and full-time staff from Project Management in preparing communications material. Frequently, Communications works directly with the editorial leadership in parallel with Project Management.

Project Components & Effort Expenditure Review

The project component bar graph, presented in Figure 3 (following page), visually depicts yearly allocation of staff time according to the structure we use for the remainder of this discussion. For the purposes of discussion, the *Tremor* project has been divided into individual phases or components, here defined. Subsequently, we will use these components

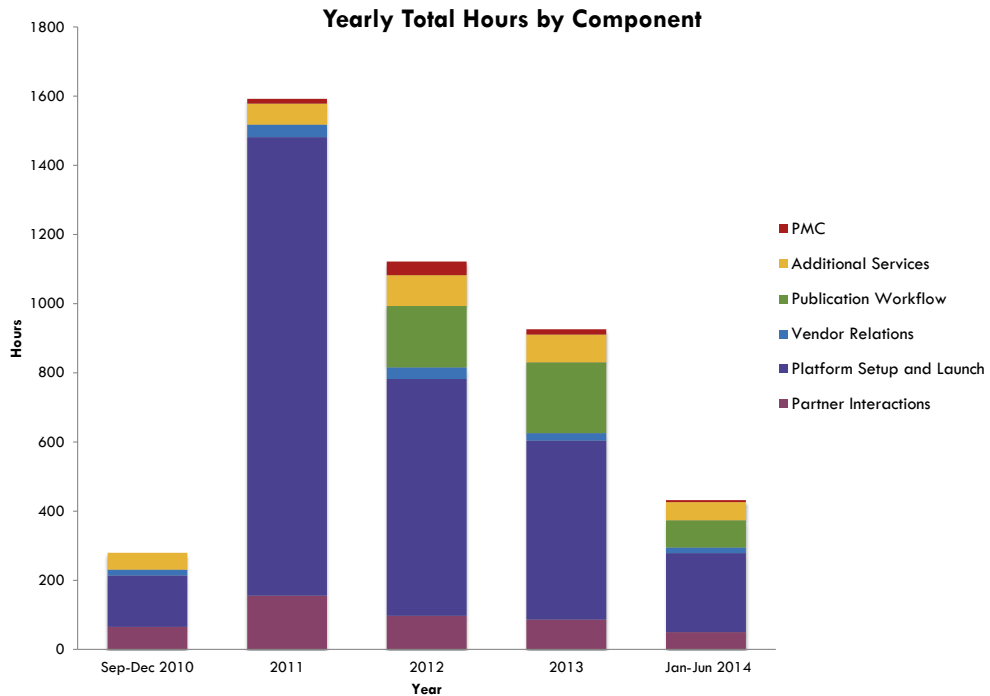


Figure 3. Hours spent by project personnel by year, coded by project component.

to provide an approximate framework of work accomplished, apportioning both real costs and estimates of efforts from the corresponding personnel categories in the ensuing section on cost estimations. Figure 4 (following page) shows the relative percentages of effort across all components for the entire project period. Following the presentation of the project components and associated allocations of staff time, the authors provide two additional composite views of the data:

- Figure 5 (following page) plots average monthly hours apportioned across all staff and all components for each year since the project's inception.
- Figure 6 (following pages) provides a summary of the aggregate data. A fuller view of the underlying data and calculations has been published and may be reviewed at <http://dx.doi.org/10.7916/D8765D1K>.
- The sequence of major project milestones has been coded by component and presented chronologically. The sequence is presented as a linked table here: <http://dx.doi.org/10.7916/D8GM8603>.

Percentage of Total Hours Allocated to Components

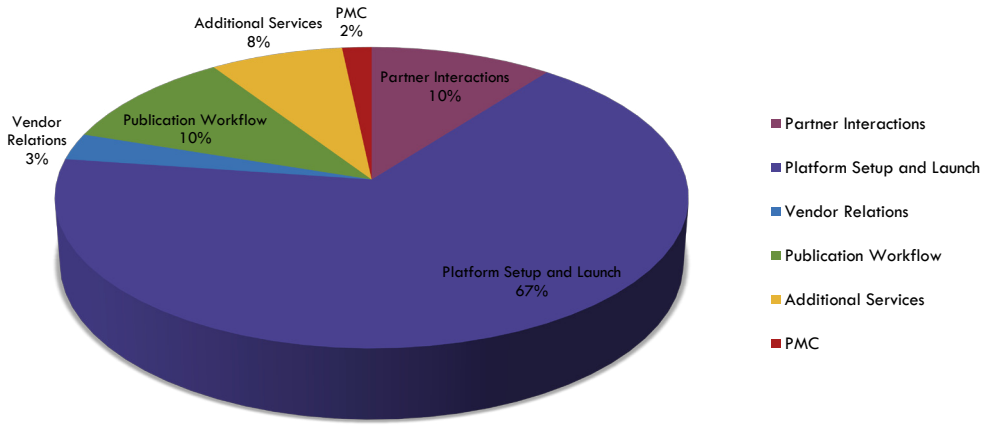


Figure 4. Percentage of total hours spent within each project component from September 2010 to June 2014.

Average monthly hours/year

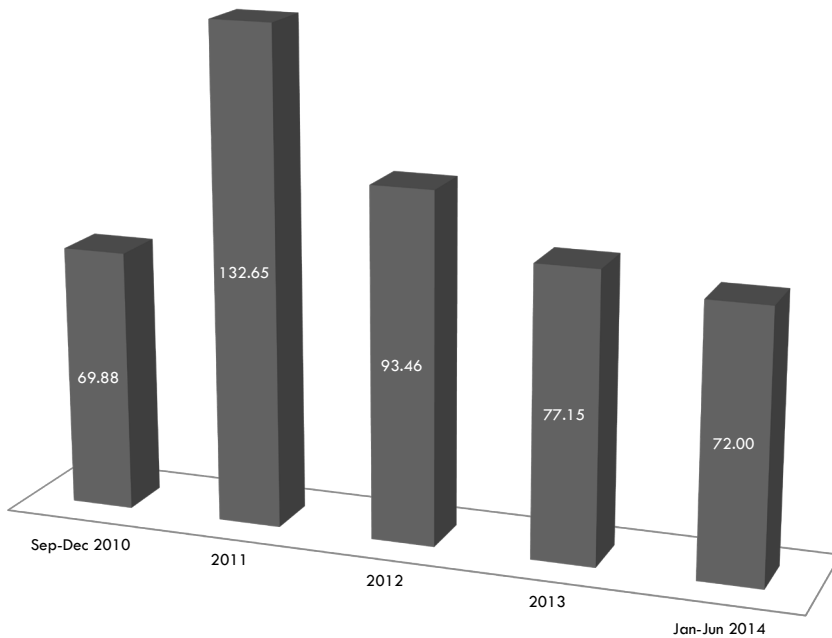


Figure 5. The average time spent working on Tremor on a per-month basis each year.

Subtotal Component Hours (Sep '10 - Jun '14)							TOTAL (hr/yr)	Monthly Avg
Partner Interactions	Platform Setup and Launch	Vendor Relations	Publication Workflow	Additional Services	PAC			
2010	65.5	148.5	16.5	0	49	0	279.5	69.88
2011	155.5	1325.85	36	0	61	13.5	1591.85	132.65
2012	97.5	684.25	34	177.5	89.25	39	1121.5	93.46
2013	86.25	518	21.5	204.5	80.5	15	925.75	77.15
2014	50.25	228.5	16	78.75	52.5	6	432	72.00
Component Grand Total (hr)	455	2905.1	124	460.75	332.25	73.5	4350.6	
Component (%)	10.46%	66.77%	2.85%	10.59%	7.64%	1.69%		

Figure 6. Summary table detailing level of effort apportioned to each of the project components across years, with overall project percentages, aggregate figures, and per month averages calculated.

Partner Interactions

Component Description. At CDRS, the success of library-led journal-publishing ventures correlates strongly with the commitment to engaged partnership between the CDRS and the editorial leadership. In support of this relationships-first model of partnership building, Project Management and CDRS leadership expend considerable effort throughout the project to meet regularly with and plan work around the needs observed and raised by *Tremor's* editor and other constituents, such as authors and reviewers. Most directly, this has meant settling into and arranging a series of biweekly face-to-face meetings where agenda are prepared and discussed on the progress of all project-related issues. Partner interactions, however, continue beyond the face-to-face meetings, into regular phone calls and email correspondence in-between appointments as well. Such partner interactions inevitably generate new production tasks, and the work of scoping and executing these to the satisfaction of the editorial management and the center leadership are likewise captured here as Partner Interactions.

Project Specifics. The production partner meetings have remained regular throughout the life of the project (i.e., the aforementioned biweekly schedule of face-to-face appointments). Those in Project Management overwhelmingly handle these engagements, although such responsibilities have moved to increasingly junior staff with the supervisory oversight of more senior members. In later stages of the project, Communications has become more directly involved in partner interactions, primarily through the preparation of copy for press releases, the management of activity on the journal mailing list, and the communication of Web analytics insights during partner meetings.

Expense Overview. Figure 7 (following page) provides the annual breakdown in estimated Partner Interaction expenditures realized since the journal's inception. During the heaviest

work in journal setup in 2010-11, Partner Interactions peaked, largely in response to the number of issues around submission quality and quantity, platform capability, prepress vendor performance, and manuscript workflow across all parties. In the years since, Partner Interaction has reduced and stabilized as many previous unknowns and problem areas have been worked out.

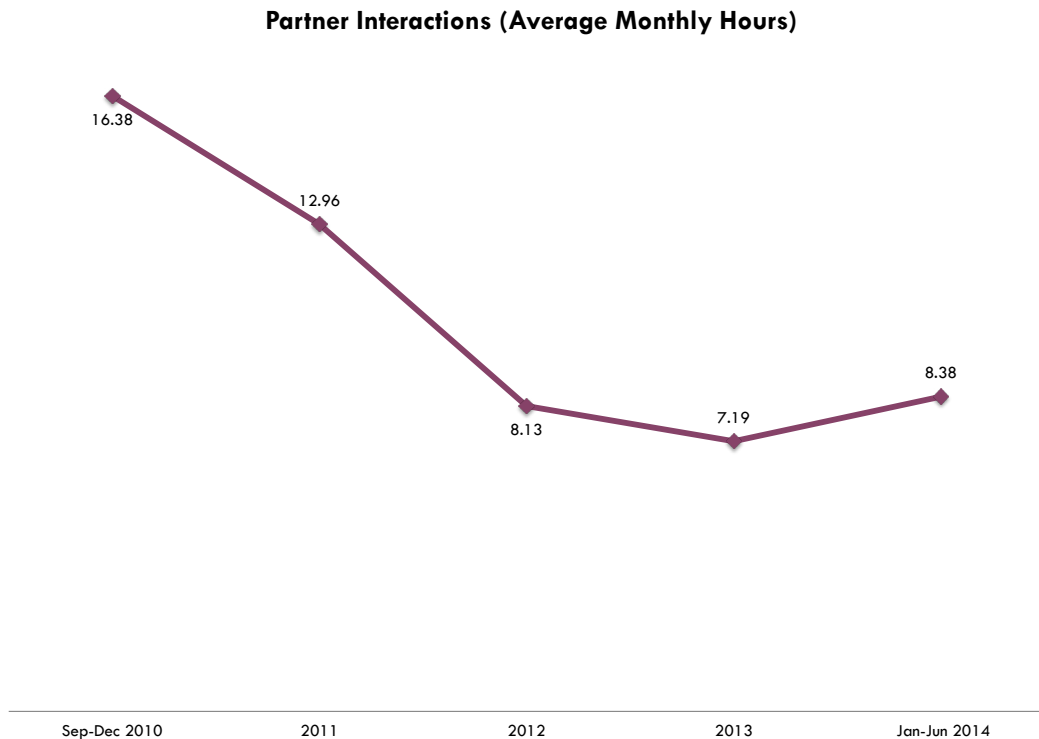


Figure 7. Average monthly hours spent on partner interactions each year. An estimated 455 total hours have been spent on this component to date.

Platform Setup and Launch

Component Description. During the Platform Setup and Launch component of the project, principles conducted a short survey of eligible publishing software, selected OJS, and initialized the software in the CDRS development environment. Platform Setup and Launch includes design treatment, information architecture design, preloading of editorial and reviewer accounts, the testing of the native OJS components, and the development of the orienting text and navigational structure for the site.

Project Specifics. Very early in Platform Setup, Production and Project Management began customizing the publishing platform to respond to editorial feedback and bespoke project needs almost immediately. Cosmetic changes to the page templates based on individual preference were coupled with much deeper customizations to the editorial workflow management tools underneath. Although Production is well-versed in PHP and the Model-View-Controller design convention (both employed by OJS), experience in working with this particular platform was in short supply, and building a customized OJS-based journal was an R&D project in production. Further, it was determined early in the project that a new set of functions needed to be built out, permitting the *Tremor* staff to send and receive journal articles in numerous stages of preparation with a third-party prepress vendor directly through the application itself, and these development costs are also reflected in Platform Setup.

Expense Overview. Platform Setup costs, which represent in large portion the efforts of the Production in the early phases of the project, dwarf Partner Interactions by comparison. By not electing to launch *Tremor* on an out-of-the-box instantiation of OJS, the CDRS team realized considerable expense in building capacity to work with the platform and to conduct testing of journal production functions with various stakeholders. Full-time staff in Production were committed to *Tremor* work in its launch year, customizing core code and building custom plugins. Figure 8 (following page) represents the annual breakdown of estimated expenditures.

Vendor Relations

Component Description. *Tremor* is unique among many of the journal publication projects at CDRS as external vendors are contracted to provide several core services. A full-suite prepress services vendor handles copyediting services (tiered, depending on the complexity of the editing assignment) as well as PDF layout, HTML, EPUB, XML preparation, and more. Additional vendors have been engaged in discussions around reprint services. Captured in the Vendor Relations category are both the ongoing weekly interactions to deliver, receive, and approve vendor goods and services as well as vendor onboarding, setup, and evaluation expenditures of effort. Real expenditures in dollars toward vendor services, however, are represented elsewhere, in the summary accounting of all financial transactions.

Project Specifics. The *Tremor* team selected its prepress services vendor based on established track-record in work with large commercial publishers, ability to provide a range of services across editorial, layout, and XML preparation, and in its willingness to facilitate transmission of published content to PubMed Central (now PMC), an early goal identified as essential to the success of the journal. CDRS Production and Project Management staff

Platform Setup and Launch (Average Monthly Hours)

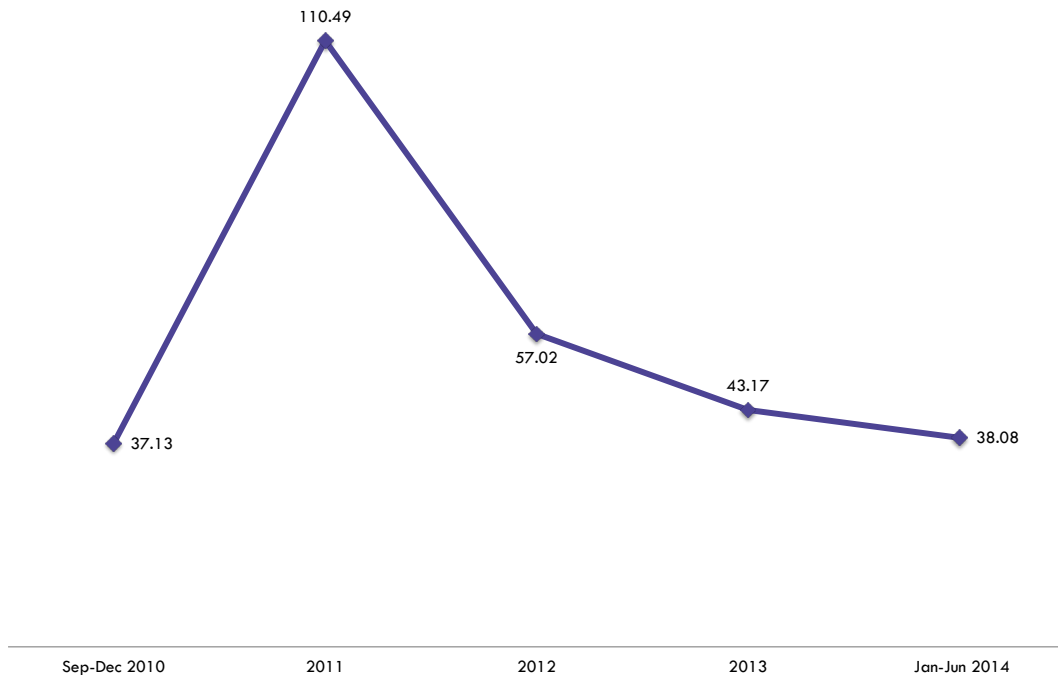


Figure 8. Average monthly hours spent on platform setup and launch each year. An estimated 2,905 total hours have been spent on this component to date.

learned quickly, however, that contracting with an established vendor is little protection against escalating costs in ensuring quality deliverables and in reconciling expectations in organizational culture. Quality, timeliness, and accountability have all been areas of concern for *Tremor* journal management in perceiving the vendor’s work, and CDRS staff have had, to varying degrees, unanticipated additional expenditures of time and energy in conducting successful vendor relations to ensure positive journal partnership.

Expense Overview. In the earliest project phases, vendor relations expenses were compounded across at least two vectors: (1) The prepress vendor provided very few tools for communicating progress of the accepted journal manuscripts, from copyediting to author-response back to journal editorial. All accounting of vendor progress of manuscript processing was handled by Project Management, an early expense later assuaged by improved vendor communication tools. (2) More significantly, quality of vendor deliverables were frequently at issue. Copyediting and typesetting infelicities recognized at late stages in

publication preparation meant additional rounds of back-and-forth with vendor contacts for remediation. This added expense is accounted for in Vendor Relations. Add to this some early engagement of a separate print-on-demand vendor that never successfully on-boarded the *Tremor* project before folding as a company, and the early rationale for additional Vendor Relations expenses takes shape (Figure 9).

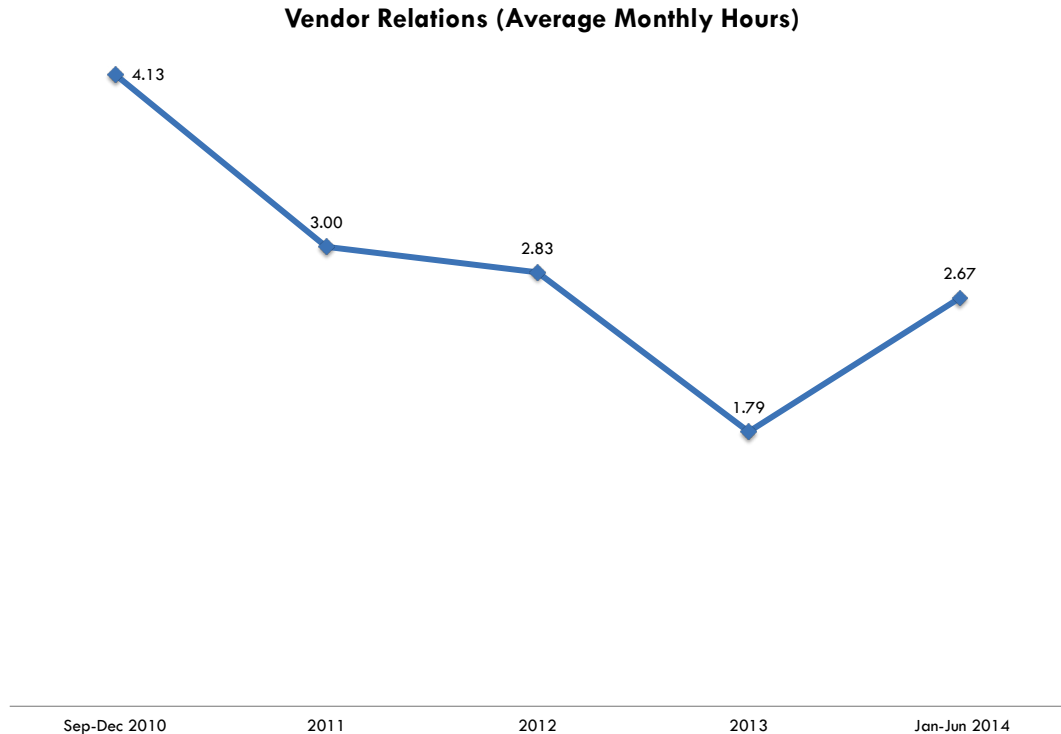


Figure 9. Average monthly hours spent on vendor relations each year. An estimated 124 total hours have been spent on this component to date.

Publication Workflow

Component Description. Publication Workflow captures expenditures of time by CDRS staff in posting solicitations for journal submissions, ensuring the journal platform successfully accepts them, that editors and reviewers can work with submissions as expected on the platform, and that they may be published to the site as expected once final galley proofs are received and approved by editorial.

Project Specifics. Publication workflow tasks completed prior to the journal launch have been captured under Platform Setup and are thus excluded from Publication Workflow. Similarly, the calculation of time and effort here attempts to separate out time spent with PMC and the article preparation vendor, which are likewise accounted for in corresponding categories.

Expense Overview. Publication workflow expenses in 2013, at 17.04 average monthly hours of Production time, were the highest seen since launch and are the highest expected (Figure 10). By mid-2012, primary responsibilities for the publication workflow had been shifted to the CDRS Project Coordinator, a junior staff position, and overall hours committed to this work has been reduced although publication volume increased in the same stretch. Higher costs in 2012 may be attributed to extra work in training supervised staff, in continuing to establish and communicate a regular procedure, and in managing against platform problems that were resolved through subsequent development.

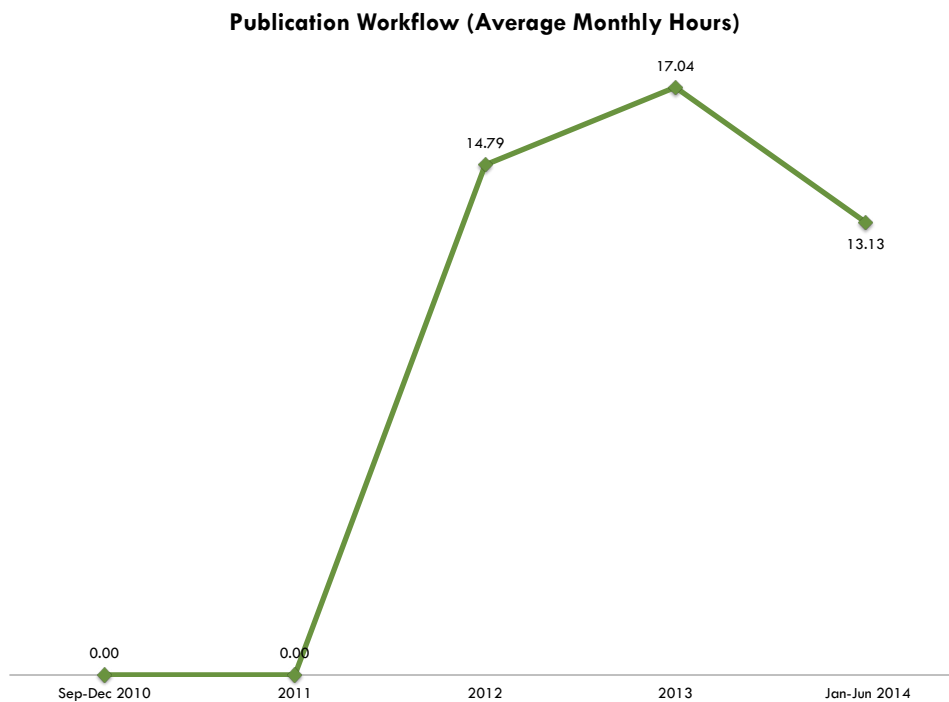


Figure 10. Average monthly hours spent on publication workflow each year. An estimated 461 total hours have been spent on this component to date.

Additional Services

Component Description. There are a number of additional CDRS-provided services that distinguish *Tremor* from other journal publishing projects in the center. Examples include the work of Communications staff to develop and produce marketing material; APC and vendor invoice processing through the library's finance office; archiving and preservation of journal content in the university's digital research repository; and development of journal-specific data management policy. Where the affordances of the areas of activity within CDRS and the libraries broadly have provided opportunity for expansion of the journal's operations, these activities have been captured under Additional Services.

Project Specifics. Midway through the reported project period, *Tremor's* editor initiated conversation with the patient-advocacy group The Tremor Action Network (TAN). These discussions produced additional financial support for *Tremor* in the form of TAN-sponsored publication scholarships. Authors submitting to *Tremor* could always elect to have the APCs waived by responding to select questions about available sources of funding. Through the TAN scholarships, however, an additional source of publication support is made available. (See Figure 11 for an accounting of waivers and scholarships granted over the life of the journal.) Oversight of the waivers and the scholarship applications adds a level of administrative overhead for both CDRS and the libraries office, and these costs begin tracking in 2012.

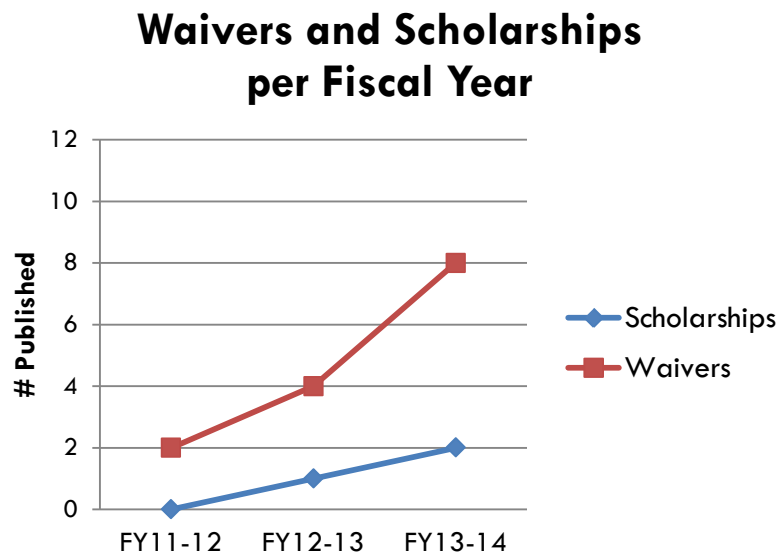


Figure 11. Waivers and scholarships awarded in *Tremor* by fiscal year date of publication.

Expense Overview. Costs under Additional Services are borne largely by three groups: the finance office as it processes APC invoices and manages *Tremor's* accounts; Communications, as it facilitates outreach through custom mailings and other forms of journal promotion; and through the junior staff in Production, preparing internal reports, archiving journal content, onboarding new services such as DOI assignment and more. With some minor variation, these costs are relatively steady across years and comprise approximately 7.6% of the overall estimated journal costs. *Tremor's* role within CDRS as an ambassador for the program suggests these costs will remain steady over time, and perhaps higher in comparison with future journals as efficiencies are realized through experience (Figure 12).

Additional Services (Average Monthly Hours)

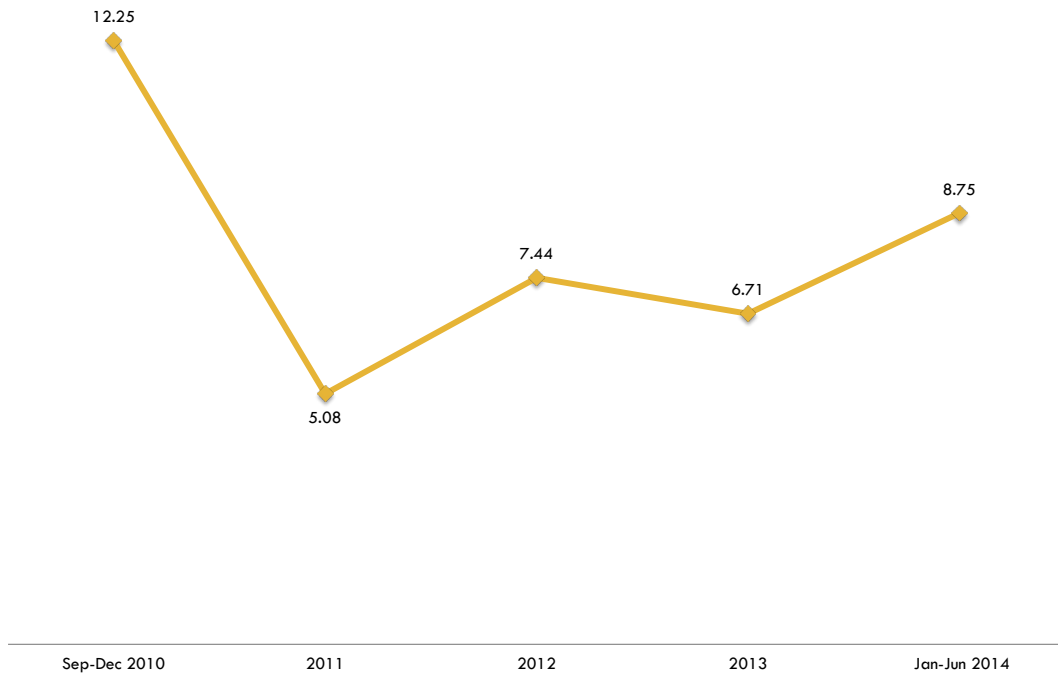


Figure 12. Average monthly hours spent on additional services each year. An estimated 332 total hours have been spent on this component to date.

PubMed Central

Component Description. Indexing in PubMed (pubmed.gov) has always been an editorial (and therefore partnership) priority for *Tremor*. To become visible in PubMed, a difficult

charge for an upstart journal, the *Tremor* team elected instead to pursue publisher status in PubMed Central (PMC), the open access archive for publicly funded medical research publications (pubmedcentral.gov). Many of *Tremor*'s authors are NIH award recipients, and their corresponding journal publications were supplied to PMC out of compliance necessity. CDRS partnered with a librarian from the Columbia University Medical Center to handle the earlier one-off deposits of individual articles in PMC, which subsequently became discoverable in PubMed. Behind the scenes, however, CDRS production and journal editorial worked extensively to meet PMC publisher-status qualifications for comprehensive coverage of journal content.

Project Specifics. Application to PMC is two-fold, with both scientific quality and technical components. As of May 2011, eligibility to apply for publisher status required continuous publication of a minimum of 30 articles. Nearly all of the early work in PMC preparation, therefore, was handled outside of CDRS (and therefore not represented in this calculation) in the solicitation, review, and publication of the initial corpus, a task made challenging by the lack of visibility of the journal in the first place.

From the production side, groundwork was laid to ensure a swift and successful scientific quality evaluation. Extensive documentation (on the makeup of the editorial board, on the rigor of the review process, on the ethics standards pursued by the journal and its editor) was published to the journal Web site. In preparation for the technical evaluation (ostensibly a review of the NLM DTD-compliant XML article galleys for validity and conformance to idiosyncratic PMC requirements), Production worked with a prepress vendor familiar with PMC to publish XML content alongside HTML and PDF expression of the articles.

Expense Overview. PMC costs, captured as a separate project component, also peak in 2012, at the height of the activity around technical assessment for journal inclusion (Figure 13, following page). There were a number of minor areas of review and concern expressed by PMC about the quality of *Tremor* XML, which precipitated several rounds of discussion with the XML-preparation. Since successful promotion to PMC publisher status in 2012, these costs have been significantly reduced, and all journal content is now visible in both PMC and PubMed, meeting the initial requirement (Figure 14, following page). Subsequent expenses have included minor adjustments to the formatted files for the inclusion of DOIs, for the publication of errata and article responses, and for outbound linking from PubMed back to the journal site. Presence in PMC remains an ongoing priority for the journal, and it is presumed these costs will never drop to zero.

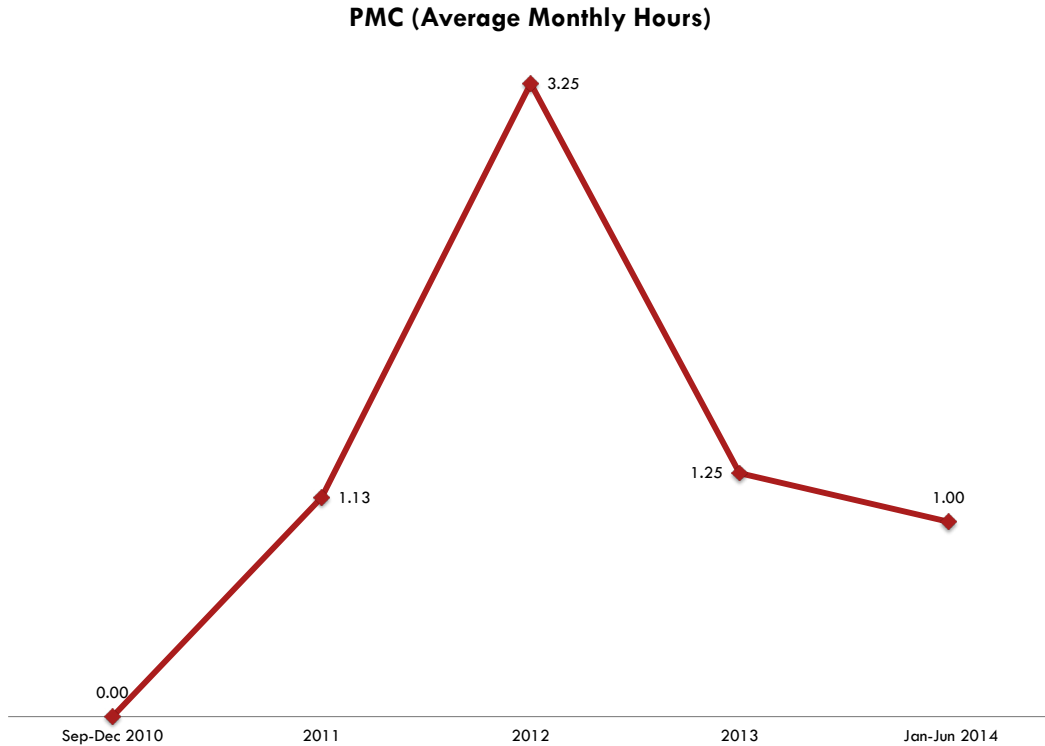


Figure 13. Average monthly hours spent on PubMed Central activities each year. An estimated 74 total hours have been spent on this component to date.

The screenshot shows the PubMed Central interface for the article "Isolated Chorea Associated with LGI1 Antibody" by Ritesh A. Ramdhani and Steven J. Frucht. The page includes the journal title "Tremor and Other Hyperkinetic Movements", the article title, authors, and a brief abstract. On the right side, there are sections for "Formats" (Article, PubReader, ePub, PDF), "Related citations in PubMed" (listing several related articles), and "Cited by other articles in PMC" (listing one article that has cited this work).

Figure 14. A Tremor article in PMC (visible here: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3889335/>).

ACCOUNTING SUMMARY

Revenues

Over and above expenditures of library staff time in production and management, *Tremor* incurs direct costs in the form of prepress vendor invoices and more, against which journal revenues may be applied by Finance. To arrive at the direct costs assessment for producing *Tremor*, we examine incoming revenue (in the form of APCs and scholarship support) against expenses incurred (vendor fees and ancillary expenditures).

APCs and Waivers

The APCs charged back to authors for the five article types that may be published in *Tremor* break down as seen in Table 1, and the aggregated totals for each article type over the history of the journal have been compiled in Figure 15 (following page).

APC levels were set in early planning meetings to provide revenue for vendor services incurred, namely copyediting and article preparation in a variety of formats (PDF, HTML, NLM XML, and EPUB). It is presumed that many authors submitting full-length papers will be presenting the results of funded projects and that the APCs may be met out of the research award. Other reports and reviews, presumed also to be shorter pieces and thereby less expensive to process, are set at commensurately lower APC levels. It was expected in planning that the schedule of APCs would cover production costs in the aggregate, even when authors of eligible articles cannot meet the requisite fee and apply instead to have the fee waived.

Type	Cost
Full-length article	\$750
Case reports	\$350
Brief reports	\$350
Letters	\$350
Viewpoints	\$0
Reviews	\$0
Letters (select)	\$0

Table 1. Corresponding APCs in the journal for various article types.

Scholarship Support

Shortly after *Tremor* moved into full production, the editor approached the patient advocacy group Tremor Action Network (TAN) and arranged for additional journal sponsorship in the form of annual publication scholarships to be provided to authors of tremor-focused scholarship. Authors who cannot otherwise meet the APC may thus apply to the TAN scholarship, and production expenses may be paid from these monies when a successful

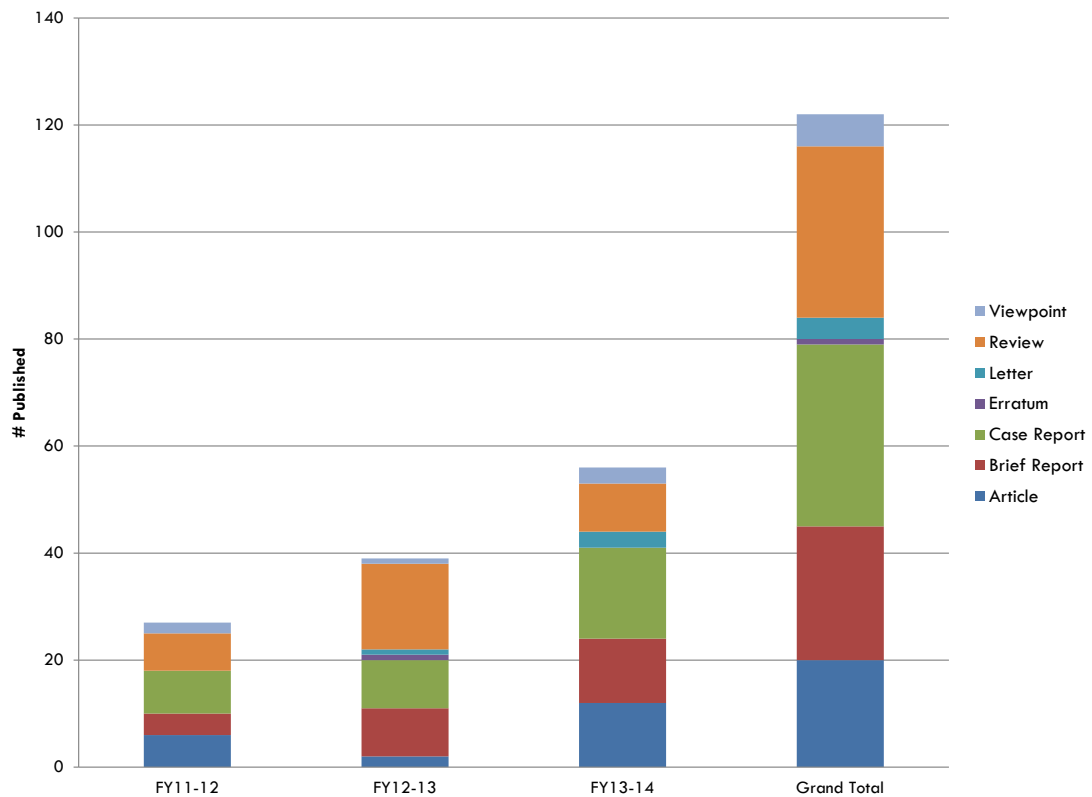


Figure 15. Article type per fiscal year.

application is made. Finance exercises management over the TAN fund, which has received two annual contributions of \$5,000 to support journal publication.

Cash Expenses

The majority of production expenses as cash outlays are realized through the use of an external vendor that conducts copyediting of manuscripts as well as final article preparation in the aforementioned formats. Midway into the project, a second, more thorough tier of copyediting service was negotiated with the vendor to handle language-editing of papers written by non-native English speakers. Other expenditures throughout the project have included the following:

- email marketing management
- custom domain name registration and renewal

- purchase of original artwork for the journal site theme
- print marketing

These non-manuscript-preparation expenses have been summarized in Figure 16, divided between recurring and one-time costs.

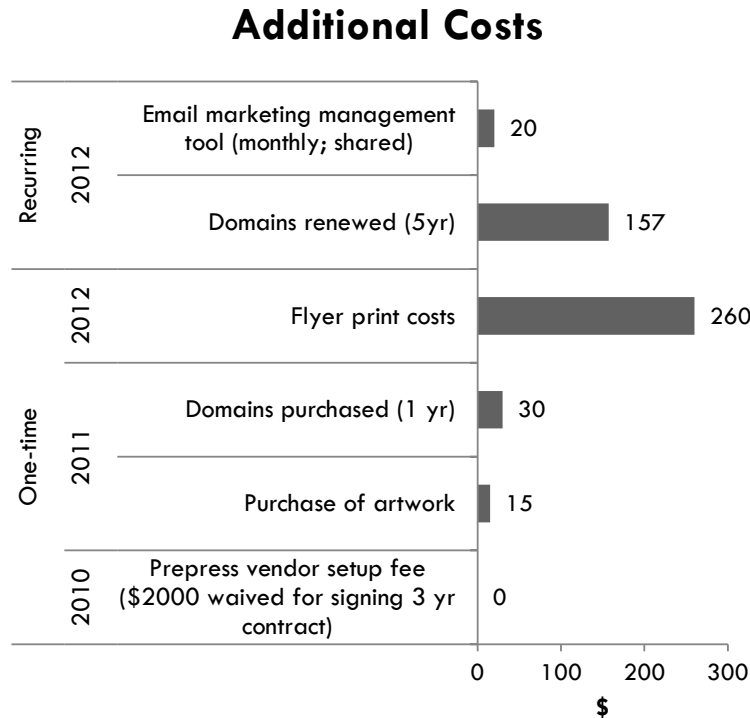


Figure 16. Detail of one-time and recurring costs.

Financials Review

Total APCs invoiced for the 122 unique articles accepted for publication into *Tremor* total \$31,300 (Figure 17). Expected vendor costs to process all articles to date total \$21,147.15, of which \$10,719.30 has been allocated to articles receiving no APC revenue. The anticipated APC revenue to date, minus vendor processing charges, leaves a positive \$10,152.85 to be applied against additional and future journal costs. Aggregated APC revenues

Tremor Financials Review	
Revenue	\$31,300.00
Vendor costs	(\$21,147.15)
Balance	\$10,152.85

Figure 17. Table of revenues and expenditures from April 2011–June 2014.

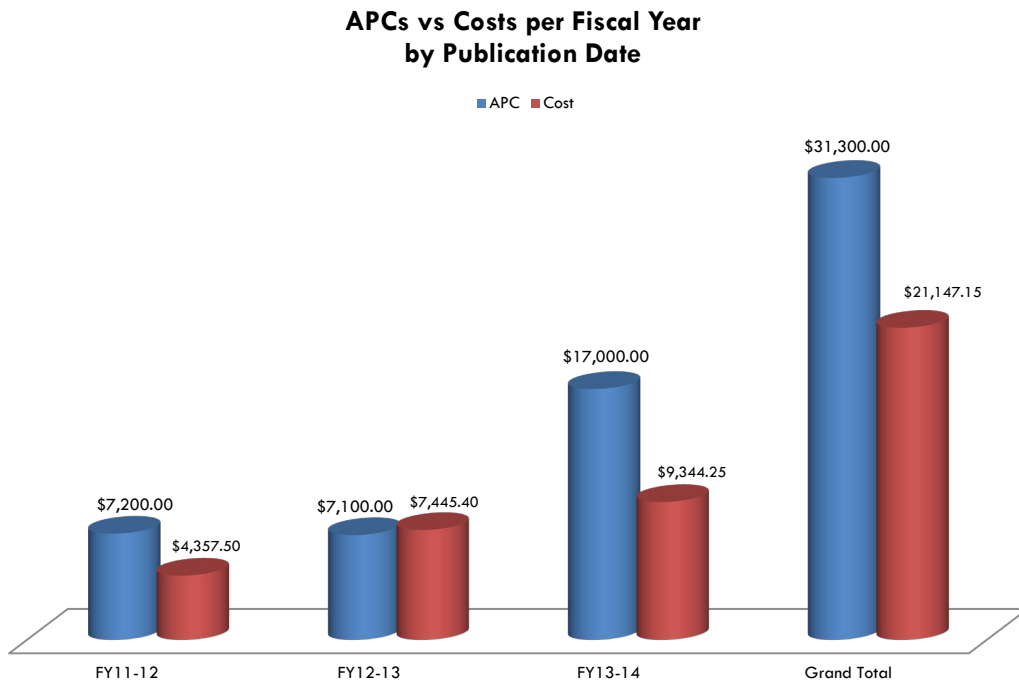


Figure 18. APC revenues versus costs per fiscal year according to date of publication.

against expenses per fiscal year are provided in Figure 18. Notably, the print-on-demand service, while live and linked from the journal site, has not yet generated any revenue at all.

Expectations for waiver requests ran as high as 50%, although in practice, the number of requests has only run 11.38% of submissions, and all waiver requests have been granted. ‘Lost’ revenue to waived APCs total \$5,300, and processing costs for articles with fee waivers totals \$1,656.90 (Figure 19). It had originally been hoped that over time that lost revenues would decrease as the TAN publication scholarship backfilled the deficit. Since submission of this article, *Tremor’s* arrangement with TAN has ended, and scholarship subvention of APC is no longer available. The general approach of seeking external partners to provide publication support to authors, however, remains a key component of the future of the CDRS journals publication program.

Waived Article Analysis	
Waived fees	\$5,300.00
Vendor costs	\$1,656.90
Vendor costs due to waivers	7.84%
Waiver requests (%)	11.38%

Figure 19. Total waived APCs for *Tremor* to date as a percentage of all accepted articles.

DISCUSSION

It is often presumed that publishing in libraries can be an inexpensive, efficient means of reaching local scholars with alternative pathways to promote research and scholarship, especially openly. Large library publishing operations demonstrate the capability of such programs to scale up and meet demand. (The work of publishing programs at the California Digital Library, University of Michigan Libraries, and University of Pittsburgh Libraries supply ample testament.) The experience of producing *Tremor* at CDRS provides a view from another angle, where investment into a single productive partnership with a member of the campus faculty is prioritized. Even so, several unexpected challenges presented themselves as detailed in the report. Dependencies on external groups (e.g., vendors, indexers, even allied intra-library offices) can be difficult to manage to the satisfaction of all partners, especially in the fledgling stages of a new publication where expediency is essential. Even when the work in question is managed directly by the libraries using library staff, project requirements can dictate a difficult path, and the extent of that difficulty may become manifest only after sunk costs inhibit course correction, such as occurred here in platform development.

From the outset, the goal of the partnership has been to produce a journal that becomes entwined in and essential to a particular scholarly community. Recent dialogue between editorial and authorial perspectives playing out on *Tremor*'s pages suggests that goal is in sight.² Other milestones and signifiers of quality and community embeddedness have lit the way for the partnership to make selective investments and advance the project; having moved on from persistent identifier assignment; PMC publisher status; and search engine indexing, the team shifts its gaze to the challenges in impact analysis, content recruitment, journal data policy, and platform performance review. The potential in the project, however, is driven in the first place by the presence of a particularly motivated and engaged editorial partner, and enabled in the second place by a risk-tolerant production environment, where research and development can proceed apace, throttled primarily by the demands of the other scholar-focused digital projects across the center.

Throughout its journals publication program, CDRS seeks efficiencies and scale. For the majority of the center's 20+ publication partners, modest platform investments can be realized quickly across titles by design. At some level, this makes *Tremor* an outlier, perhaps due to the idiosyncratic needs of its disciplinary orientation. From another vantage point, however, it is expected that *Tremor* is emblematic of the first-of-a-kind philosophy that drives all investment and innovation in the center. Work on the journal has pioneered processes for

² <http://cdrs.columbia.edu/cdrsmain/2014/06/open-scholarly-discourse-in-flagship-journal/>

custom Google Scholar indexing, for identifier service interfaces, for scholarship fund setup and maintenance that are already being applied to other journal partnerships. Revenue surpluses, such as those reported here, speak to the viability of the funding approach taken and invite conversations around adjustment or reduction of APCs³ and novel application of the scholarship funds to further drive growth of the journal and engagement of the scholarly community to which it supplies venue.

ACKNOWLEDGEMENTS

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REFERENCES

- Björk, B.-C., Welling, P., Laakso, M., Majlender, P., Hedlund, T., & Guðnason, G. (2010). Open access to the scientific journal literature: Situation 2009. *PLoS ONE*, 5(6), e11273. <http://dx.doi.org/10.1371/journal.pone.0011273>
- Clarke, R. (2007). The cost profiles of alternative approaches to journal publishing. *First Monday*, 12(3). <http://dx.doi.org/10.5210/fm.v12i12.2048>
- Devakos, R. & Turko, K. (2007). Synergies: Building national infrastructure for Canadian scholarly publishing. *ARL Newsletter*, 252/253(16), 18–19. Retrieved from <http://www.arl.org/bm~doc/arl-br-252-253-synergies.pdf>
- Fisher, J. H. (2008). Scholarly publishing re-invented: Real costs and real freedoms. *The Journal of Electronic Publishing*, 11(2). <http://dx.doi.org/10.3998/3336451.0011.204>
- Hahn, K. (2008). *Research library publishing services: New options for university publishing*. Retrieved from <http://www.arl.org/bm~doc/research-library-publishing-services.pdf>
- Hedlund, T., Gustafsson, T., & Björk, B.-C. (2004). The open access scientific journal: An empirical study. *Learned Publishing*, 17(3), 199–209. <http://dx.doi.org/10.1087/095315104323159621>

³ As of September 2014, the journal has lowered its APC for research articles from \$750 to \$650. This decision was based on a detailed analysis of incoming revenue and costs expended, along with an exploration of multiple scenarios of altered and reduced fees. This change came at the request of the Editor-in-Chief, and the reduction was approved by the Library Finance department.

- Houghton, J., Rasmussen, B., Sheehan, P., Oppenheim, C., Morris, A., Creaser, C., Greenwood, H., Summers, M., & Gourlay, A. (2009). *Economic implications of alternative scholarly publishing models: Exploring the costs and benefits*. Retrieved from <http://www.jisc.ac.uk/media/documents/publications/rp-teconmicoapublishing.pdf>
- Hovav, A. & Gray, P. (2001). Managing academic electronic publishing: Six case studies. *ECIS 2001 Proceedings*. Retrieved from <http://aisel.aisnet.org/ecis2001/42>
- King, D. W. (2007). The cost of journal publishing: a literature review and commentary. *Learned Publishing*, 20(6), 85–106. <http://dx.doi.org/10.1087/174148507X183551>
- Kosavic, A. (2010). The York Digital Journals project: Strategies for institutional Open Journal Systems implementations. *College and Research Libraries*, 71(4), 310–321. <http://dx.doi.org/10.5860/crl-36r1>
- Library Publishing Coalition. (2013). *Library Publishing Directory 2014*. Retrieved from http://www.librarypublishing.org/sites/librarypublishing.org/files/documents/LPC_LPDDirectory2014.pdf
- Mangiafico, P. & Smith, K. L. (2014). Reason, risk, and reward: Models for libraries and other stakeholders in an evolving scholarly publishing ecosystem. *Cultural Anthropology*, 29(2), 216–235. <http://dx.doi.org/10.14506/ca29.2.03>
- Maughan Perry, A., Borchert, C. A., Deliyannides, T. S., Kosavic, A., & Kennison, R. (2011). Libraries as journal publishers. *Serials Review*, 37(3), 196–204. <http://dx.doi.org/10.1016/j.serrev.2011.06.006>
- Mullins, J., Murray-Rust, C., Ogburn, J., Crow, R., Ivins, O., Mower, A., Nesdill, D., Newton, M., Speer, J., & Watkinson, C. (2012). *Library publishing services: Strategies for success: Final research report (March 2012)*. Purdue University Press e-books (2012). Retrieved from http://docs.lib.purdue.edu/purduepress_ebooks/24
- Newton, M. P. & Morris, J. N. (2013). Building *Tremor* Journal: Examining the costs of open access publishing. Columbia University Academic Commons. <http://dx.doi.org/10.7916/D8J38QMT>
- Solomon, D. J. & Björk, B.-C. (2012). A study of open access journals using article processing charges. *Journal of the American Society for Information Science and Technology*, 63(8), 1485–1495. <http://dx.doi.org/10.1002/asi.22673>
- Van Noorden, R. (2013). Open access: The true cost of science publishing. *Nature*, 495(7442), 426–429. <http://dx.doi.org/10.1038/495426a>

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