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Bringing *eLife* to life

In June 2011, three of the world's leading research funders – the Howard Hughes Medical Institute, the Max Planck Society and the Wellcome Trust – announced plans to launch an open access journal publishing the most influential research in the life and biomedical sciences. The new journal would be run by a community of active researchers. In addition to driving open access, the key priorities of the publisher, *eLife* Sciences, were to establish a swift and decisive editorial process, and to explore ways in which digital media can be used to maximum effect in the communication of new research. More broadly, the journal *eLife* has a mandate to experiment and to be a catalyst for innovation in all aspects of scholarly communication. *eLife* has now been publishing for just under a year.

Introduction and motivations

The communication of new research findings is an integral and vital part of the research life cycle. From the perspective of an organization that funds or conducts research, if the scientific outputs are not communicated in the most effective and timely manner, then the investment in science does not achieve the influence or reach that it should. These are some of the considerations that have led funding agencies across the world to develop open access policies which expand the access and reuse of research findings[1].

MARK PATTERSON
Executive Director,
eLife Sciences

The funders behind *eLife* have all been active in the open access arena. However, limitation of access is only one of the issues that these funders perceive as problematic in research communication. Beginning with discussions in 2010, the Howard Hughes Medical Institute, the Max Planck Society and the Wellcome Trust quickly came to the shared view that there are many other aspects of the publication process of journals that are not optimized for the fields of research that they fund. They also agreed that they should take a step beyond policy development and collaborate on a new project in research communication that would address some of these other concerns.

> "… a new project in research communication …"

What were the deficiencies in the existing journals identified by the founders of eLife Sciences? Broadly speaking, the publishing process was felt to be inefficient and was not making the most of the capabilities of communication using digital media. For example, research takes too long to get published; authors are being asked for ever more extensive revision, and frequently work undergoes multiple rounds of revision and review; the published output is placed behind pay-walls; and large amounts of information and data are aggregated and buried in supplementary files of limited value. These problems were seen as widespread, but particularly notable in the top tier of journals[2,3,4]. To address these concerns, the founders came to the conclusion that they could have the most impact on the journals system as a whole if they launched a journal – *eLife* – that would provide a viable alternative to the top research journals.

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Five core principles of the new journal were identified:

- it must be run by active researchers who could engage constructively and knowledgably in the editorial process, and who are remunerated for the work that this journal would require

- the editorial process must be fine-tuned to eliminate unnecessary revision before publication, whilst ensuring that the content accepted for publication is of the highest scientific calibre

- editorial selection of content should be rooted firmly in scientific judgment, regardless of considerations of the potential to accrue citations or publicity

- work should be presented in full and using digital media to the maximum extent

- the work should be open access – free of access and reuse barriers, under the terms of the Creative Commons Attribution Licence[5].

With these ambitious goals established, the founders made their first public announcement about their intentions in June 2011, and the project was launched[6]. Shortly thereafter, Randy Schekman (a professor in the field of cell biology at the University of California at Berkeley) was appointed as the first editor-in-chief, and the editorial board, the staff and the infrastructure began to be put in place.

The editorial process at *eLife*

eLife is testing new ground in various areas, but so far it is the editorial process that has generated the most interest and positive response within the research community[7]. Responsibility for this process rests with the editor-in-chief, who is supported by two deputy editors, 18 senior editors and a community of about 175 reviewing editors who perform the key role in peer review, as summarized below.

Before full peer review, as in many journals, *eLife* operates a triage process whereby the senior editorial team selects the manuscripts that are most likely to meet the high scientific standards set by *eLife*. Currently, around one half of the manuscripts received are invited for full submission and review, but it is the subsequent peer-review process that sets *eLife* apart from other journals. Manuscripts are assigned to one of the reviewing editors, who also identify one or two colleagues (usually external to the editorial board) to act as reviewers. Once their reports have been submitted, the reviewers conduct an online consultation to identify any key revisions that need to be made. The reviewing editor is then responsible for consolidating the reviewer reports into a single set of instructions to the authors, so that the authors know exactly what they need to do in order to get the work published. The goal is to limit the revisions to only the essential adjustments, and typically (currently in approximately 70% of cases) the reviewing editor will not have to go back to the reviewers to assess the revision once it is resubmitted. Overall then, the process is designed to be quick and constructive, decisive and unambiguous. Although other journals have been exploring improvements in peer review similar to the approaches adopted by *eLife*[8], it is the particular combination of approaches that *eLife* offers that has led to such a strong and positive reaction from the research community to date.

For the manuscripts that do not meet (after peer review) the scientific standard for publication in *eLife*, all reviewers are asked for permission to pass on their reports and identities to another journal. This can save time for authors who choose to resubmit to another journal (and who request that the reviewer reports are passed on).

Content presentation

Another important goal of *eLife* is to present the published work in the most effective ways using digital media. There are several ways in which this is being accomplished. As a newly launched journal, *eLife* is a digital product with no legacy content. The basic layout of the articles puts a premium on simple and clear design, so that the reader experiences as few

> "*eLife* is testing new ground …"

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distractions as possible[9]. The PDF design also takes account of digital devices, such as tablet readers, which influenced the choice of a single column format[10].

eLife avoids the use of supplementary files that present collections of additional experiments, results and interpretations. Instead, authors are encouraged to describe their work in full, with the narrative supported by additional items (e.g. figures, tables, inline video, data sets). *eLife* also encourages authors to provide additional data files that support the main arguments in the work, such as figure supplements and source data files. This allows for deeper exploration of the work and the underlying data. All of the items accompanying the narrative are assigned their own digital object identifier (DOI), which is derived from the main article DOI, such that each DOI resolves to a landing page for that item. In this way, every component of the article is made more discoverable, useful, linkable, and even citable (Figure 1).

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Every article published in *eLife* also includes a tab that provides a range of article-level metrics, covering usage (both at the journal website and at PubMed Central), citation metrics from Scopus and PubMed Central, and metrics from social web resources, such as Mendeley and Twitter. Several of the data types that *eLife* makes available are sourced from ImpactStory[11], an emerging supplier of web metrics for scholarly content, referred to as article-level metrics, or 'altmetrics'[12].

PLOS has been one of the pioneers in the provision of article-level metrics, and first began adding these data to their articles in 2009[13]. Since then, many other publishers have added similar metrics to content they publish. In this way it is possible to show how different articles within the same journal can have different kinds of scholarly and social impact. More broadly, it will be possible to use article metrics as an important new tool in research assessment. It is still early days, but with increasing interest from publishers, funders and institutions, and the development of new resources to provide and study such metrics, there is growing evidence of a movement away from the use of the journal impact factor and journal names as the dominant indicators in research assessment. Notably, the recently announced San Francisco Declaration on Research Assessment (which eLife Sciences helped to craft), has received thousands of signatures, and also advocates for a shift in emphasis away from journal-based metrics towards the assessment of individual research outputs[14].
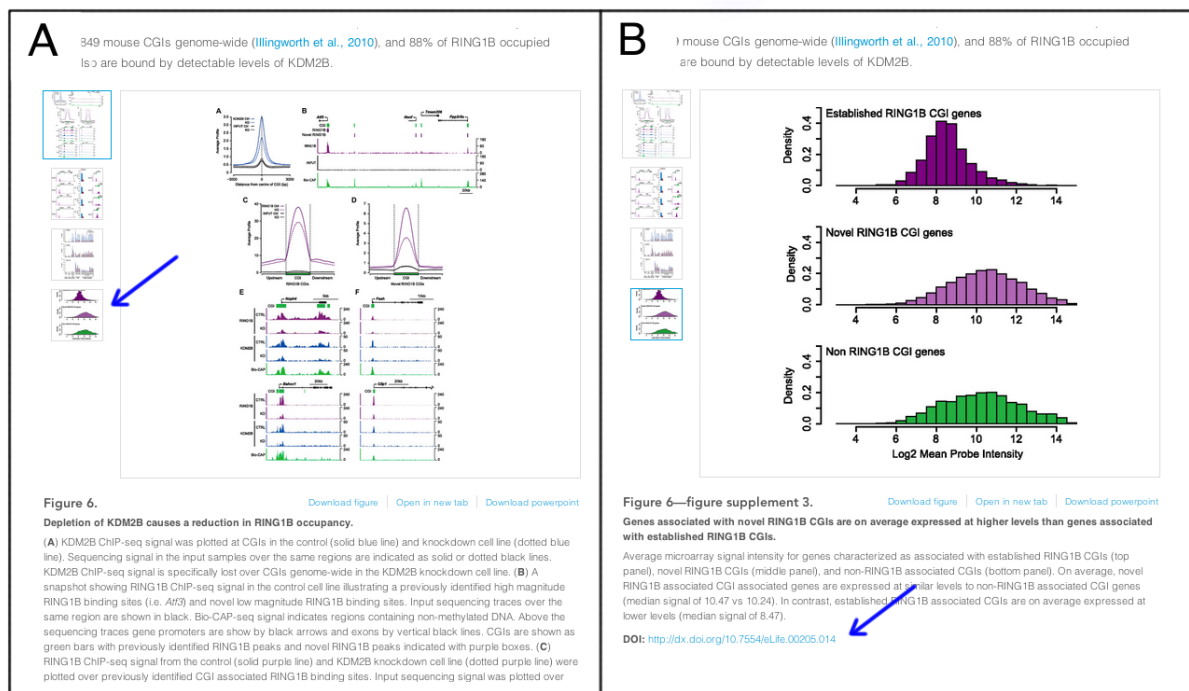

Figure 1. Two screenshots from an *eLife* research article. Part A shows a figure that has three figure supplements. By moving the cursor over the lowest thumbnail (indicated by arrow), the third figure supplement appears as shown in part B. The arrow in part B highlights the DOI which is provided for each of the components of the article and links to a landing page for that component.

To further extend the accessibility and utility of the research articles published in *eLife*, professional writers compose a non-technical summary for each article, referred to as the *eLife* Digest. A limited amount of non-research content, including Editorials, essays and personal perspectives, is also published in *eLife*.

Infrastructure and workflows

For the launch of *eLife*, existing publishing technology suppliers have been selected to support the publishing processes. The journal management system is supplied by eJournal Press, which could support the online consultation aspects of the *eLife* editorial process. TNQ, based in Chennai, India, provides content processing services and generates the XML and PDF versions of the content, which are supplied to HighWire Press, who built and host the journal website. HighWire also offers the opportunity to 'co-develop' the journal website, which allows *eLife* developers to work on new features independent of HighWire and, when completed, selected features from *eLife* can then be merged back into the main HighWire platform.

"…new tools, features and infrastructure …"

As an open access publisher, eLife Sciences aims to ensure that content achieves the maximum possible reach, and is available on a variety of useful platforms. To support this aim we have constructed an extensible distribution service, built on top of Amazon Web Services, that automatically distributes content to a variety of endpoints, including PubMed Central, Mendeley, ScribD, Github, and a datastore supporting a highly flexible read/write API via FluidInfo[15]. The goal here is to encourage reuse of the content by humans and machines, to explore the most useful formats in each case, and to aggregate and record these uses of the content as article metrics. Much of this work is experimental in nature, and eLife Sciences will be regularly reporting on its findings.

With a small internal technology development team, eLife Sciences also intends to develop new tools, features and infrastructure that are broadly relevant to research communication. A first step in this direction was achieved recently with the release of the 'eLife Lens' pilot product[16]. The goal of eLife Lens is to provide a new and improved way to read and explore content online. One specific issue 'Lens' addresses is allowing readers to navigate easily back-and-forth between the narrative and the supporting items (figures, tables, videos, references, etc.) in articles. If a reader is looking at a figure, for example, and wishes to quickly navigate to each of the places in the text where this figure is cited and discussed, Lens supports this functionality (Figure 2). Lens is available under the Berkeley Software Distribution (BSD) open source license, and will be subject to further testing, refinement and development in the coming months.

Future prospects

The most important feature of eLife Sciences is its association with organizations that fund science. With the funding and committed support of these organizations, *eLife* has quickly established itself as a desirable venue for the publication of peer-reviewed research of the highest scientific calibre. Editorially, the journal is run entirely independently of the funders, and the journal considers and publishes excellent work regardless of sources of funding. Through its association with research funders and practitioners, eLife Sciences emphasizes the integral role that research communication plays in the research process itself.

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eLife will continue to rely on funding agencies for economic sustainability for some time to come. It is likely that *eLife* will charge publication fees in the coming years, although the fee and the date of introduction have not yet been finalized. In part, these considerations will be influenced by the changing scholarly communication landscape. Given the growth of open access publication, there are signs that an effective publishing market is emerging in the biomedical and life sciences, whereby immediate open access is supported by publication fees. Authors have options to publish in a variety of journals offering different
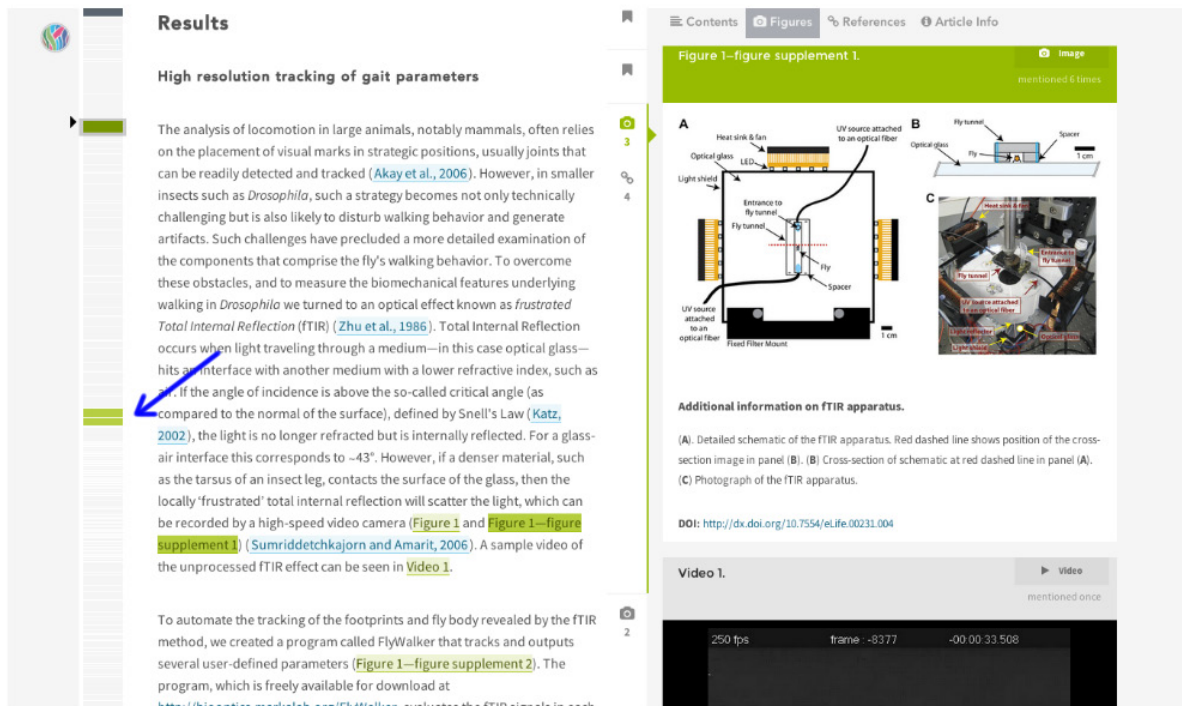
Figure 2. Screenshot from eLife Lens. The Figure shows how the main components of the Lens viewer provide the narrative text of the article with display items shown in the main right-hand panel. In this example, 'Figure 1 – figure supplement 1' is shown to the right, and in the text the citation to this Figure is highlighted in green. The vertical 'map' of the article, which runs down the left side of the screen shows the position of the paragraph that is currently being viewed from the article (highlighted dark green with a small black triangle to the left). Further down this column there are two more paragraphs in light green (indicated by the blue arrow) which contain further references to the same figure. The reader can therefore easily navigate back and forth between the text and supporting items.

services and selection criteria. With transparent publication fees, authors can make better informed decisions about the value for money associated with these journals. However, this approach is by no means established in all fields, and the fees that are typically set by major publishers (commercial and non-profit) are beyond the reach of researchers in poorer parts of the world. To address this issue, many open access publishers whose journals are supported by publication fees offer waivers for authors who do not have access to sufficient funds. Considering the broader landscape of scholarly communications, it is likely that alternative methods of funding will be necessary to support comprehensive open access across all disciplines and all parts of the world.

eLife Sciences has a mandate from the founders of the project to experiment and explore new approaches in research communication. So far, the innovation that has generated the most interest and support from the research community is the approach to editorial selection and peer review. As discussed, *eLife* is also exploring new technological approaches to the presentation and reuse of content. One other area where *eLife* has departed from the traditional approach is in media relations. *eLife* does not operate a traditional embargo-based press release system, whereby the media are given privileged access to articles ahead of publication. As media relations policies were being developed at *eLife*, scientists and media representatives expressed concerns that embargoes reduce the willingness of researchers to discuss their findings in meetings where the media might be present (lest they violate the rules of the publication where their work is 'in press'). A decision was made by *eLife* to make clear that authors could discuss their work at any stage, and that *eLife* would not issue embargoed press releases. Instead, *eLife* works directly with press officers, authors and the media to facilitate the highest quality media coverage of the published work. It is important to stress that this approach is still considered experimental, but it is encouraging to see the extensive media coverage of some of the articles that have been published thus far[17].

> "*eLife* works directly with press officers, authors and the media …"

eLife Sciences is a unique project at an early stage in its development. Looking ahead, the priorities are to ensure that *eLife* continues to publish the finest research in biomedicine and the life sciences, and that the standards of editorial speed and service are maintained as submissions to the journal grow. It is also important to continue the exploration of innovative approaches to every important aspect of the publication process, and that the organization shares its findings for the broader benefit of research communication, so that it can fulfill the expectations of the visionaries behind *eLife*.

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Mark Patterson, Executive Director, eLife Sciences
Sheraton House, Castle Park, Cambridge, UK CB3 0AX
Tel: +44 1223 370155 | E-mail: m.patterson@elifesciences.org