



Innovations to Advance Research Communication, Discovery, and Analysis.

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Session:

149 — *Evolving serials – managing, discovering and supplying highly innovative and dynamic content* — Serials and Other Continuing Resources

Abstract:

Discipline-specific digital tools are now commonplace in the research process – however, these tools are not yet standard in the formal communication of research results. Furthermore, as science, by its nature, produces lots of data, the same formal communication should also allow for integration of this data in the peer-reviewed and published article.

Elsevier looks at these two issues from a holistic perspective of innovation. The Article of the Future is Elsevier's project to deliver a richer form of formal scientific communication, while SciVerse Applications provides the underlying framework to do so in an optimal way. Together they offer:

- *Optimal presentation and reading experience – improving ease of user understanding.*
- *New pallet of content that includes interactive data sets – enriching the content, and thus bringing the research output from an author closer to the reader.*
- *Contextualized information that connects the article to trustworthy scientific resources – linking the formal scientific record with associated external data sets and other contextual information that is available on the internet.*

In this session, Elsevier explains its process to transform the traditional concept of scientific communication into a platform that adapts to serve the needs of researchers – both authors and readers, and thus institutes. Elsevier shares what it has learned from collaborations with the

scientific community and demonstrates the necessity of an information model that connects with and supports the workflow of researchers.

Introduction

As the world speeds through the Age of Big Data, harnessing the data on the web and turning it into useful insight remains a challenge. Science, by its nature, produces lots of data, and it is often not an easy task for researchers to make their data available to other researchers in such a way that the data can be easily discovered and interpreted correctly for validation and re-use.

Discipline-specific digital tools to gather, analyze, store and manage data are now commonplace in the research process. However, the output of such tools is often not fully supported in the formal communication of research results, and researchers often have to “dumb down” their data into text or images to include them in their article. This disconnect is clearly calling for better solutions to support researchers in disseminating their research data and results.

Technological advancements can play a key role in addressing the above challenges by offering researchers the right tools to disseminate their research and to better manage the overwhelming volume of information available to the scientific community. Elsevier is very active in this field with initiatives like the Article of the Future and the SciVerse Application Framework – leveraging modern technologies to create an optimal publication format with support for domain-specific research output and customized workflow solutions.

The Article of the Future is Elsevier’s ongoing project to deliver a richer form of formal scientific communication. It offers improved online presentation, support for rich, interactive content and valuable contextual information integrated into the article.

SciVerse Applications provides the underlying framework for many of these functionalities, and also offers the end-user a range of domain-specific solutions to enhance the research experience. Researchers and scientists can use Elsevier’s content APIs to create web-based applications (widgets) on ScienceDirect and Scopus platforms. SciVerse Applications features a marketplace and developer network that allows the scientific community to build and use applications that enrich content and enhance the research experience. Collectively, researchers and librarians can customize search and discovery processes and collaborate with developers to create new apps.

Together Article of the Future and SciVerse Applications offer:

- Optimal presentation and reading experience – improving ease of use and enabling readers to develop deep insights efficiently.
- Support for new content types in the article to bring the research output from an author closer to the reader. A prime example of this program is the Interactive Google Maps viewer, which turns an author-delivered KML (Keyhole Markup Language) file with geospatial information into an interactive map.

- Contextualized information that connects the article to trustworthy scientific resources – linking the formal scientific record with associated external data sets and other contextual information that is available on the internet.
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The Article of the Future



Researchers create multitudes of research output. This includes the traditional research article, but also (and increasingly so) data, computer code, multimedia, and domain-specific electronic data formats. As research output increases, so does the need for efficient selection and exploration. Simultaneously, readers' habits for digesting information are evolving; and so are new technologies to exchange information and share insight.

... and scholarly publication needs to adapt

Intro "the Article of the Future" - a project to improve the scientific article

- Elsevier wants to enhance the online article so that it allows researchers to optimally communicate scientific research in all (digital) dimensions:
- Support authors by giving them the best possible place to disseminate research in all its dimensions
- Increase value to readers by providing an environment that offers an optimal reading experience and makes it possible to build deep insights fast

While the needs of researchers to exchange their work are changing, and readers' habits and technologies are changing, the online article itself hasn't really adapted. Scientists work with digital tools, scientific results became digital, and scientific data sets are exchanged digitally. But when it comes to publication, the process and solutions are lagging behind, forcing a researcher to squeeze complex research onto a "rectangular area with ink on a piece of paper."

Article of the Future: concept and approach



Approach:

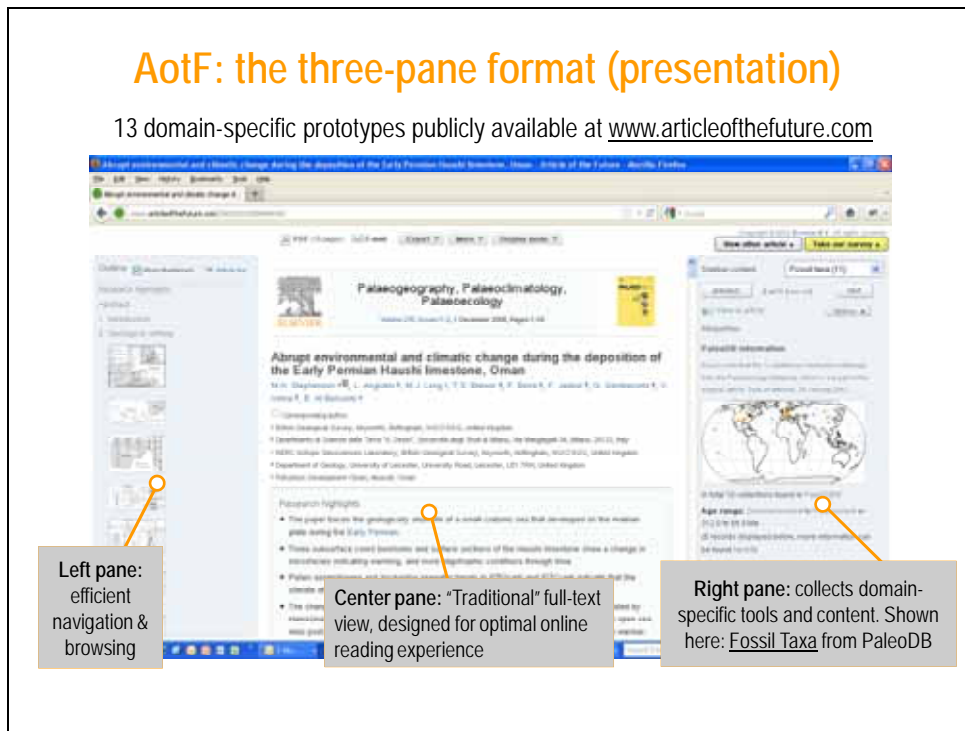
- Deeply involve researchers through interviews, workshops, forums, surveys, etc. Over 800 people provided feedback.
- Focus on domain-specific enhancements.
- The Article of the Future is a framework rather than a solution - continuous enhancement by specific applications, database links, and other features.

Elsevier is committed to addressing the changing needs of researchers in the digital age through the Article of the Future, an ongoing project to enhance the online publication format. . There are three components to the Article of the Future concept:

1. Presentation: Offers an optimal online browsing and reading experience, taking full advantage of content and context value-adds.
2. Content: Supports authors to share a wider range of research output and express their research in all its (digital) dimensions – including data, computer code, multimedia files, and domain-specific data standards such as KML files for geospatial data.
3. Context: Connects the online article to trustworthy scientific resources to present valuable additional information in the context of the article. This includes linking with data repositories through interactive SciVerse applications.

Researchers were, and are, deeply involved in the process of identifying needs to publish and access research output. Since different research domains use different tools and different workflows, a domain-specific approach was clearly needed to connect to existing workflows and offer truly better ways to publish research. One size does not fit all!

Rather than an end-point solution, the Article of the Future is a framework that allows future extensions – for example to improve support for new content elements or create new links to data repositories. This makes it possible to continuously adapt to the specific needs of different research communities in the face of a rapidly changing environment.



This is a screenshot of a prototype article in Palaeontology, which is one of 13 domain-specific prototype articles available on articleofthefuture.com.¹ The general presentation and look and feel are universal for all prototypes, but there are many features and functionalities that are specific to each of the 7 scientific domains. In January 2012, the first phase of the Article of the Future format was implemented across ScienceDirect, affecting all articles for which an online HTML version is available. Further implementation and new enhancements are expected in mid-2012 and beyond.

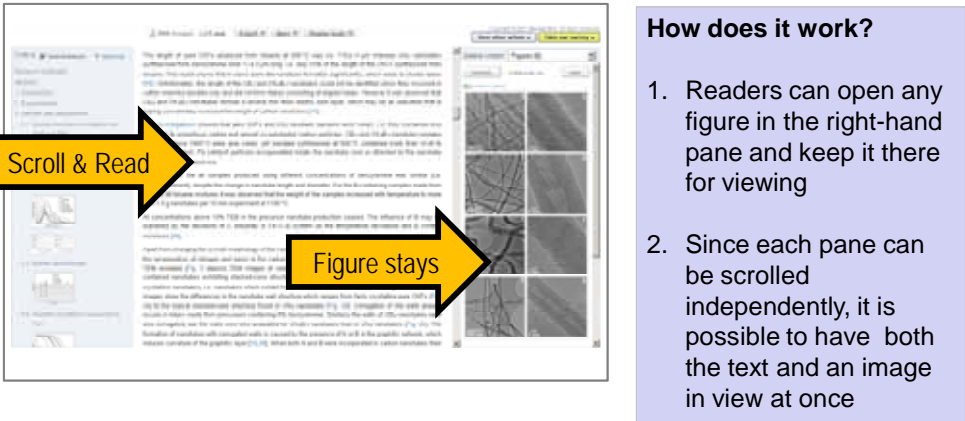
For the general format, a three-pane view was chosen:

- The left pane is for browsing & navigation, allowing the reader to quickly find the relevant sections in the article. Images are also included here, as for many researchers these are key decision-making tools to determine the relevancy of an article.

¹ www.articleofthefuture.com/S0031018208004690

- The middle pane is designed for optimal “full-text article” reading experience. This incorporates typographical lessons from the PDF such as column width and heading size, ported to the online environment for an optimal reading experience.
- The right pane collects additional content and tools that are available for the article. This includes author information, a reference browser, an image browser, and many more domain-specific tools. The right-hand pane is the home for SciVerse applications, which can for example be used to display relevant experimental data or information from a data repository, such as in the example with the PaleoDB database shown above.

Selected feature: Figure browser (presentation)



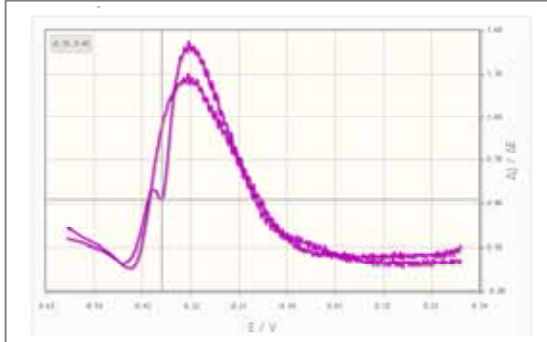
How does it work?

1. Readers can open any figure in the right-hand pane and keep it there for viewing
2. Since each pane can be scrolled independently, it is possible to have both the text and an image in view at once

This screenshot shows the figure browser functionality for one of the prototype articles on articleofthefuture.com.² This browser allows the reader to easily explore all figures in the article, but also to “pin” a figure to the right-hand pane where it remains in view while scrolling through the text in the middle pane. A similar tool is available for references, making it very easy to access bibliographical details for referenced articles side by side with the main text.

² www.articleofthefuture.com/S0008622310002770

Selected feature: Data cursor (content)



How does it work?

1. Readers can open up selected figures from the main article in “interactive viewing mode”
2. Using the crosshairs functionality, the reader can access the underlying data at any location on the graph

This screenshot demonstrates a data cursor tool³ that allows readers to explore and access data points underlying a plot through a crosshair operated by the mouse. This functionality requires that the author also makes the data available for their plot. This is currently a prototype only, but implementation on SciVerse ScienceDirect is under investigation.

³ <http://www.articleofthefuture.com/S0956566308004417>

Selected feature: Interactive Google Maps (content)

- Content Innovation: turn a static image into a source of information that helps to gain insights efficiently and facilitate validation and re-use of data
- Elsevier was the first publisher to introduce interactive maps to regular, scientific peer-reviewed articles
 - Currently 80+ participating journals
 - Close to 300 articles with KML files submitted
 - Extending support to KMZ files

How does it work?

1. Authors store geospatial data as a .KML file (using regular GIS tools)
2. Authors upload .KML files as supplementary material through EES (may also be at revision stage)
3. Elsevier turns this into an Interactive Map and includes this in the online article
4. Readers can explore map from the article, or download KML file



One of the key directions in which Elsevier is enhancing the online article is by improving support for **Content** in the sense of domain-specific data formats. This approach is exemplified by the Interactive Google Maps viewer shown here. This application turns geospatial data uploaded by authors (in the KML data format) into an interactive map that the reader can explore from within the article, or download for further analysis.

This is a prime example of innovating content at Elsevier - essentially turning the traditional, static image of a map into a source of information that helps researchers to gain insights efficiently and that facilitates validation and re-use of data. Elsevier was the first publisher to introduce interactive maps to the regular, scientific peer-reviewed literature. There are currently 80+ participating Elsevier journals, with close to 300 submitted articles.

Selected feature: Data-linking with PANGAEA (context)



How does it work?

1. Authors (or data managers for large projects) deposit data at PANGAEA and provide publication info
2. Online article reader sees an interactive application that visualizes data on the map
3. SciVerse Application contains link to full data record at PANGAEA

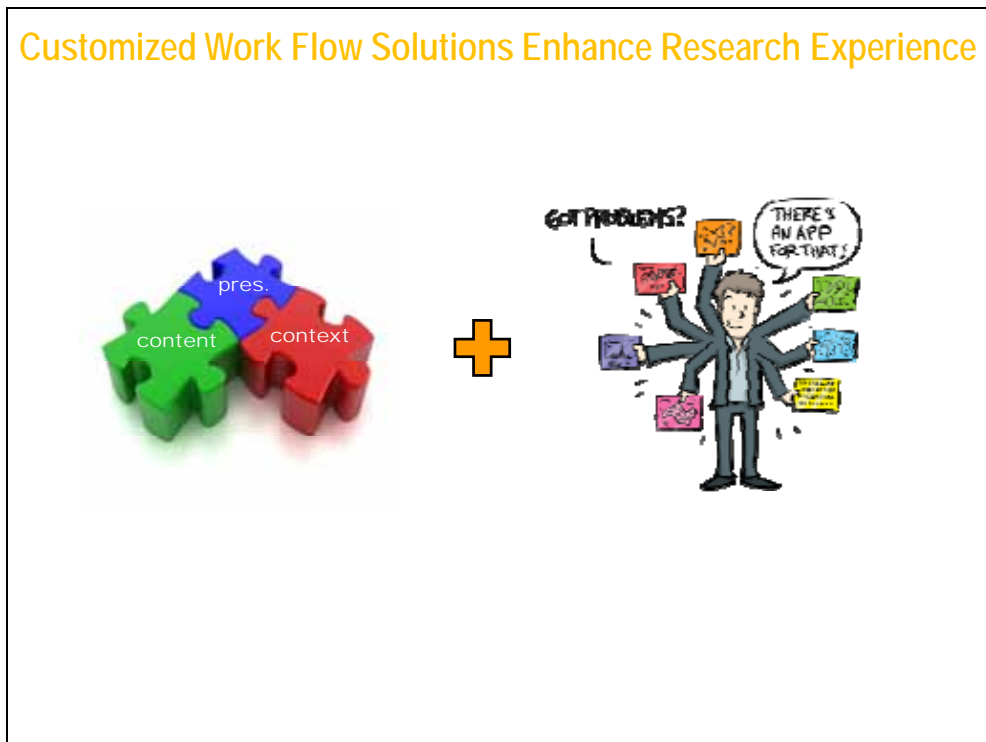
As part of the ambition to add valuable **Context** to the article, Elsevier is keen on setting up reciprocal links between article and data repositories. This is adding value for both sides: Article readers obtain easier access to the underlying data, while users of the data repository will appreciate the right context of a data set since the article is in many ways the “perfect metadata record” for their data set - describing how the data was gathered, how it should be interpreted and if there are any limitations to further use.

Elsevier has several solutions to create links with data repositories. The most advanced option is to utilize the **SciVerse Application Framework**, which makes it possible to develop web-based applications (or widgets) on the article home page that have access to the full-text content but also to other information resources on the internet.

An example of a SciVerse application that enables linking with an external database is the **PANGAEA linking application** (shown here). The application queries the PANGAEA database for data records in their system that the author has associated with the article that is being displayed on SciVerse ScienceDirect. If there are relevant data records, they are shown on an interactive map. The reader can access a description of the data record by clicking on the points of the map, and follow a link to PANGAEA to get to the actual data.

Elsevier and PANGAEA have collaborated to connect articles and data by seamlessly integrating the PANGAEA viewer application within the online article. The PANGAEA linking application is currently available for 100+ Elsevier journals

SciVerse Applications



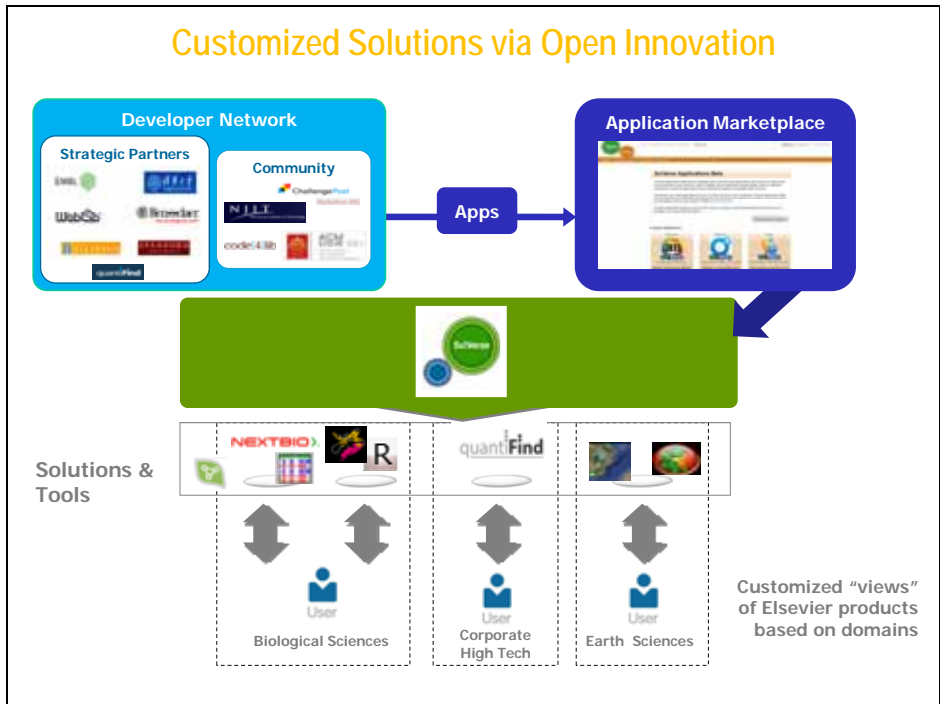
Beyond PANGAEA and data repository linking, Elsevier partners with institutions around the world and encourages collaboration between researchers, librarians and computer science departments to provide the talent base for developing apps for researchers. The purpose is to increase awareness among libraries about using app development resources within their institutions or even outside developers to create research workflow solutions.



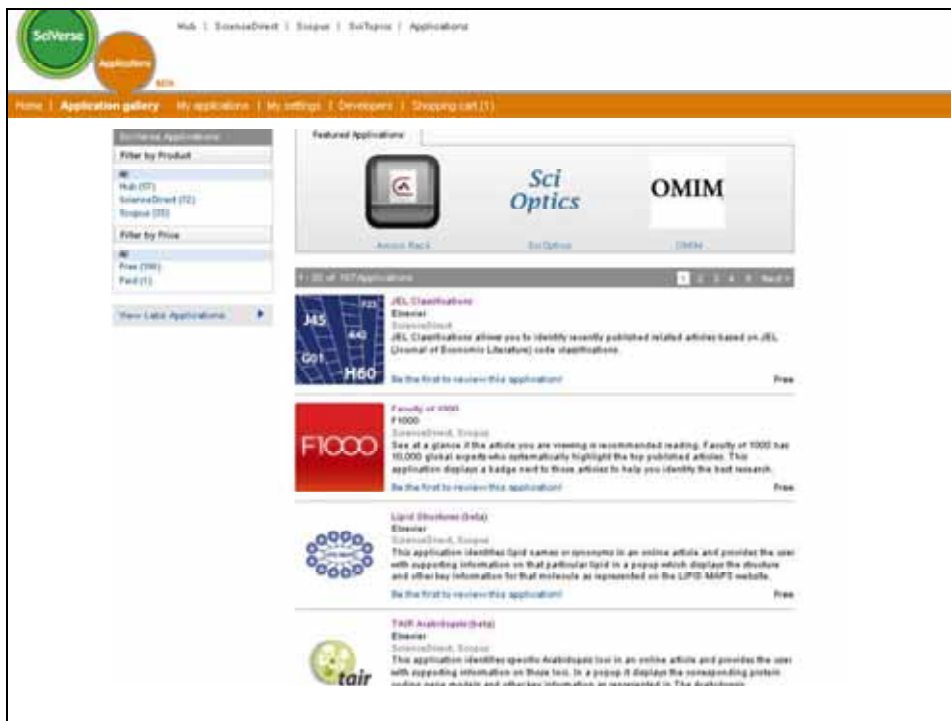
The research process and journey to discovery are made easier when we create solutions that enable scientists to find relevant information and extract insight more efficiently, saving time and money. Content is also enriched to increase the **quality** and **quantity** of research output. Researchers may develop a customized data bank that they can continue to develop and maintain for their own continued use as well as to share with collaborative partners worldwide.



Apps provide solutions for researchers by researchers – for example linking abstracts or full text papers to data sets – that provide an efficient way to sort and analyze data.



SciVerse Applications can be used across multiple scientific disciplines.



The SciVerse Application Marketplace has apps that focus on these disciplines:

- Biochemistry
- Genetics
- Clinical Medicine
- Chemistry
- Pharmaceutical sciences

The screenshot displays the Lipid Structures application interface. At the top, it states "LIPID MAPS is supported by National Institute of General Medical Sciences". The main window shows a chemical structure of Valeric acid (pentanoic acid) with the common name "Valeric acid" and the systematic name "pentanoic acid". The structure is a five-carbon chain with a carboxylic acid group at the end. The chemical formula is CCCC(=O)O. Below the structure, the following information is provided:

LM ID	LMFA01010005
Common Name	Valeric acid
Systematic Name	pentanoic acid
Synonyms	C-5:0

On the left side, there is a list of article titles and a table of applications. The table of applications includes:

Application Name	Version	Download
Lipid Structures (beta)	1.0.0	Download
Valeric acid	1.0.0	Download
Pentanoic acid	1.0.0	Download
Valeric acid	1.0.0	Download
Pentanoic acid	1.0.0	Download

This is an example of the Lipid Structures application. The app identifies lipid names or synonyms in an online article and provides the user with supporting information on that particular lipid in a popup which displays the structure and other key information for that molecule as represented on the LIPID MAPS website.

Summary

Elsevier is committed to enhancing the online article so researchers can optimally communicate scientific research and collaborate.



Rich, interactive content:
Interactive Google Maps



Three-pane format for
optimal reading experience



Data Repository linking:
PANGAEA



Application solutions for
more efficient workflows

Conclusion

The ubiquity of data and new methods to perform research in the digital age are changing the needs of researchers with regard to accessing and sharing scientific output. Meeting those needs calls for innovations in the publication process that help support researchers in disseminating their work and in gathering information and insights efficiently.

Elsevier's Article of the Future is an ongoing project to improve the online publication format in several directions: supporting new forms of content (example: Google Maps viewer for KML files), connecting the article to data repositories such as PANGAEA, improving the overall online presentation, and creating App solutions for more efficient research workflows.

Collaborations with the scientific community have demonstrated the necessity of an information model that connects with and supports the workflow of researchers. Elsevier continues to fund innovations that challenge the traditional concept of scientific communication and transform it into a platform that brings a new way to experience research, with flexibility to adapt to the needs of researchers – authors and readers, and the advancement of global science.