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The Future of Peer-Reviewed Scientific Video Journals

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Peer-Reviewed Scientific Video Journals

by David Stern

Video journals, pioneered by *Journal of Visualized Experiments* (*JoVE;* jove.com), are the next phase for publishing peer-reviewed material. The platform and associated policies and procedures are specifically designed to effectively handle information in video format. *JoVE* is unique and important, both in proposing industry standards and challenging existing publishing practices and infrastructures. It is leading the way toward mainstreaming many other alternative media formats. This article will discuss some of the underlying considerations and implications.

JoVE is a peer-reviewed video journal. It initially focused on life sciences research and is now expanding into other scientific areas. Its mission is to "increase the productivity of scientific research." The journal is indexed in PubMed/MEDLINE, Scopus, Chemical Abstracts, and SciFinder. The journal contains more than 2,490 video protocols, with 60 new articles added per month. The target audience is gradu-

ate students, post-docs, undergraduate students, and industry researchers in biology, medicine, and related fields. The journal reports more than 200,000-plus visitors per month. Currently, 164 articles are available as open access.

This new technology addresses the time- and resource-consuming process of learning and staying current with techniques and procedures in the advancement of scientific research and drug discovery. *JoVE* believes that "Written word and static picture-based traditional print journals are no longer sufficient to accurately transmit the intricacies of modern research."

JoVE emphasizes that "[v]isualization of the temporal component, or the change over time integral to many life science experiments" can overcome the inherent limitations of traditional, static print journals, "thereby adding an entirely new parameter to the communication of experimental data and research results."

The publisher further states, "JoVE takes advantage of video technology to capture and transmit the multiple facets and intricacies of life science research. Visualization greatly facilitates the understanding and efficient reproduction of both basic and complex experimental techniques, thereby addressing two of the biggest challenges faced by today's life science research community: i) low transparency and poor reproducibility of biological experiments and ii) time and labor-intensive nature of learning new experimental techniques."

PUBLISHING IN *JOVE*

Each "video article" entry is composed of two parts: a written component and a video of the protocol filmed in the author's own laboratory.

The journal accepts written submissions that follow a Manuscript Instructions for Authors document. The sub-

mission also requires a standard manuscript template or, for medical case studies, a medical manuscript template, and a Materials/Equipment template. These materials are available as downloads from the journal's site.

In terms of video production, *JoVE* can have its professional video production service film, produce a video, and handle all video editing based on the submitted manuscript text. Alternatively, authors can create their own videos. Author-produced submissions must contain the written manuscript and the completed video. The videos must fit within the *JoVE* format and style as well as meet the technical guidelines specified in Guidelines for Videos Produced by Author. Author-produced videos receive no editing assistance from the *JoVE* production staff. For author-produced submissions, both the video and manuscript are editorially and peer-reviewed at the same time, and therefore they must be submitted together.

This is a typical example of a citation to a freely available video article:

Meyerson, J. R., White, T. A., Bliss, D., Moran, A., Bartesaghi, A., Borgnia, M. J., et al. Determination of Molecular Structures of HIV Envelope Glycoproteins Using Cryo-Electron Tomography and Automated Sub-tomogram Averaging. J. Vis. Exp. (58), e2770, doi:10.3791/2770 (2011) found at jove.com/video/2770/determination-molecular-structures-hiv-envelope-glycoproteins-using.

NINE SUBJECT AREAS

Peer-reviewed materials within the journal are placed in the following subject sections: General, Neuroscience, Immunology & Infection, Clinical & Translational Medicine, Bioengineering, Applied Physics, Chemistry, Behavior, and Environment.

In addition to these materials, there is a new journal element—the Science Education Video Database, which teaches lab fundamentals via easy-to-follow video demonstrations. There are two sections: General Laboratory Techniques, which introduces specific pieces of equipment such as pipettes, centrifuges, and Bunsen burners, and Basic Methods in Cellular and Molecular Biology. One example in the latter is a 9-minute video demonstrating the basics of DNA gel electrophoresis (jove.com/science-education/5057/dna-gel-electrophoresis). These educational videos appear at the correct learner level and are well-produced. There are currently 15 items in each of the sections.

LIMITED SUBSCRIPTION OPTIONS

Subscription to the *JoVE* video journal is only by institution; there are no personal or individual subscriptions available at this time. The publisher explains, "Most JoVE video articles are filmed and edited by video professionals. Since video production is very expensive, the cost per article for JoVE is much higher than for traditional, text-only publications. It is not possible to cover the costs of video production based on the typical open-access model, in which fees are typically collected from academic authors. Consequently, we made the difficult decision to make a large portion of our content only available to paid subscribers in order to cover these costs." Nonsubscribers can search the journal at its website, but only the open access articles can be viewed.

The license allows for reserves, course packets use, and occasional interlibrary loans. *JoVE* has an entrepreneurial twist—you can buy shirts and computer accessories, such as cases and skins for your iPhone, iPad, and laptop, at its CafePress site (cafepress.com/jovejournal).

JOVE COMPETITORS

While the peer-reviewed elements of *JoVE* are the first fully peer-reviewed video materials to appear in journal format in the industry, the laboratory techniques and methods documentation already has a competitor in the SAGE Research Methods product (srmo.sagepub.com). The SAGE video tool is designed to help students and researchers across the social, behavioral, and health sciences design research projects, understand methods, or identify new methods, conduct research, and write up their findings.

The standard SAGE search and discovery tools are supplemented by Methods Maps that visualize relationships among 1,400 items in a custom-designed taxonomy of methods terms, concepts, people, and literature. The SAGE tool also provides suggested related methods and links (plus a pop-up definition function), and specially commissioned videos. In addition, Methods Lists can be created by individuals and used to share previously discovered information and to browse by topic. In the area of video methods and techniques, it will be interesting to see the overlap in subject content and the differences in access points between SAGE and *JoVE*.

Another video-based training service is offered by Alexander Street Press (alexanderstreet.com/products/video-collections). There are a number of subject-specific video libraries offering hundreds of hours of training material in areas such as Counseling and Therapy, Rehabilitation Therapy, Nursing Education, Dental Education, Education, and the soon-to-be-released Engineering Case Studies Online.
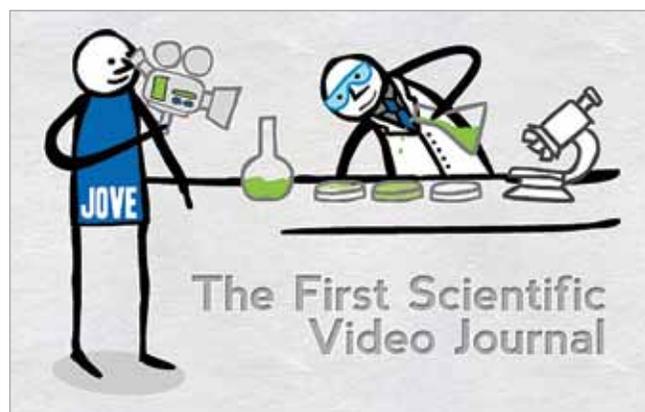
JoVE takes advantage of video technology to capture and transmit the multiple facets and intricacies of life science research.
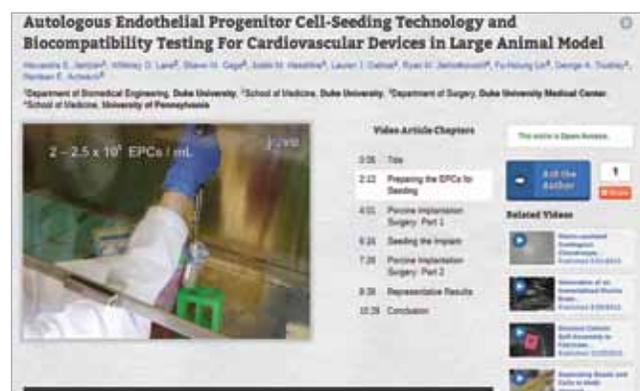
A JoVE open access article showing chapters, social elements of querying the author directly and sharing with colleagues, and related videos

UNIQUE MEDIA CONSIDERATIONS

JoVE can be viewed as a demonstration platform for the future of video/media distribution of peer-reviewed material. The journal platform demonstrates what is possible, and necessary, for effectively ingesting, mining, and serving video content. The infrastructure required new types of technical tools, processes, data elements, access points, and delivery methods.

Reverse engineering was required to adapt to some of these new considerations, when *JoVE* began in 2006. New media-specific metadata elements needed to be understood, standards needed to be developed, and author instructions needed to be distributed and supported. YouTube may be ubiquitous, but the quality of most videos found there is not good enough for peer-reviewed items. New editing and indexing processes were required to mark up the video materials. New types of access points, associated metadata, and linking tools needed to be developed that could jump into subportions of streaming/linear video files. New applications needed to be built to handle these types of materials and services.

The search functionality is not as sophisticated as with some other services. There is no advanced search capability. Search results can be limited by author, institution, date, and subject section. Keywords are hyperlinked, so they can be used to amplify results. Navigation through the video articles provides unique insights.

NAVIGATING THROUGH RESULTS

The current Navigation options listed below include some newer elements, including the Materials and the Ask the Author elements. Some of these types of enhanced metadata—such as underlying product support data and protocol descriptions—already exist in other indexing databases such as Chemical Abstracts.

- Cite this article
- Introduction
- Representative results
- Disclosures
- Materials
- Ask the author
- Abstract
- Protocol
- Discussion
- Acknowledgments
- References

The editorial focus is on ensuring potential discovery and reuse based upon subject, procedure, discussion, and equipment terms. What would be advantageous in this indexing scheme are new video-related, media-specific keywords. The terms could address concepts for special video concerns, such as angles, zoom-in scenarios, slow motion or high-speed recording, lighting/fluorescence considerations, and nonlinear access to internal sections that were created

initially as simple linear procedures within the video capture process. Some of these concepts may surface through full-text searching, but they're not part of the metadata.

MINING NEW DATA WITH EXISTING TOOLS

One obvious question is how well this type of enhanced video metadata and these new access options can be handled by other indexes and harvesting tools. First, additional traditional subject indexing tools such as PsycINFO and the Web of Science should index this journal purely due to the subject material. Second, other harvesting and discovery services such as Summon, Primo, and EDS should incorporate this material within their core content.

This raises the issue of how well existing tools can ingest, service, and filter these additional video-specific facets. Even if the new video-related metadata can be parsed and identified by the indexing services, can current resolvers point to video articles or portions of video articles? The full articles do have DOIs. Will new DOI or OpenURL protocols need to be established for segments of videos in much the same way that they should be for segments of text articles?

Assuming the delivery protocol works, will this medium require new viewing capabilities through enhanced browsers, new delivery protocols, or add-on apps? How well will such media delivery work on mobile devices? There are many technical issues to be coordinated in order to make our current search and delivery services seamless for video materials—especially to users with varying preferences and technical capabilities.

MINING DATA WITHIN THE *JOVE* PLATFORM

The *JoVE* platform, with its reverse engineering designed specifically for video material, provides opportunities for
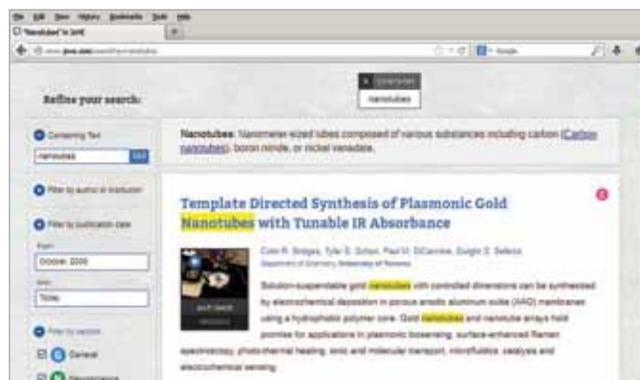
Search results can be limited by author, institution, date, and subject section. Some results show a definition of search terms at the top of the video.

The search functionality is not as sophisticated as with some other services; all it provides is a single search box.

more advanced video manipulation and delivery. It should be possible to develop more sophisticated linkages among ingested materials. These added-value options could be determined by elements of the video medium itself.

Applications can be created based upon the enhanced or limited options of the initial serial medium. Will new methods need to be developed to provide common and powerful visual options that already exist in our text-based environment? For instance, are there limits to easily browsing a serial medium for subsections that are not as visually intuitive as they might be in paper, such as scanning for embedded methods or protocol sections, graphs, charts, and images?

Beyond simple subsection navigation within an article, can connections be built between related subsections (i.e., methods, materials, protocols) of similar articles? This would provide an advantage over current text-based links usually offered only at the full-article level.

> # How does one define success and value with these new video tools?

relative distances, special relationships, graph differential changes, and associated graphic behaviors among variables). These types of supplemental searchable metadata would provide enhanced context for sighted viewers as well.

Second, it would be possible to highlight relationships between article elements based upon their inherent properties and/or actions. Video images can show actions and properties in dynamic ways, and this could be used to great effect. For instance, if video elements and their associated properties or actions are coded as objects with properties (using RDA triad values), you could then provide a series of demonstration video clips with similar activities or properties. Imagine three videos showing three different types of repairs to unintentional bleeding during different types of surgical procedures.

Many other types of video mining and presentation possibilities could be explored and used—some only on specific native platforms, but others across devices if the appropriate interfaces and applications can be developed.

RELATED VIDEOS

The *JoVE* platform currently offers the Related Videos option. The associations are made by the editor, using a full-text editing ontology. At some point it might be possible to use an automated system to identify relationships, especially as the scale of the materials and the ontology becomes larger. The video segments can be identified, as they are already created in the Navigation fields, but at present the indexing is performed at the article level. Therefore, more precise searching and specific relationships cannot be made across multiple articles at the Navigation field level.

Will these types of deeper associations among and between video materials be made in the future? Will these cross-article linkages be carried into other search services using special video descriptors, or will this enhanced navigation remain proprietary because such linking requires special preharvesting and manipulation of metadata to discover such deeply rooted relationships?

FORMAT OPENS UP POSSIBILITIES

Other possibilities that might be included within this video-designed platform could address at least two additional image considerations. First, those providing access for vision-disabled users, such as the Reading for the Blind and Dyslexic organization, have a slightly different approach to indexing and description when addressing the concepts and context of images. They describe not only the elements of the image, but also the important things "seen intuitively" within images but not described in captions or descriptions of images (i.e.,

IMAGE FEATURES ON OTHER PLATFORMS

While *JoVE* is the only journal composed completely of peer-reviewed videos, there are other industry platforms that are already serving STM video materials at varying levels of integration and sophistication. A few examples are mentioned later.

The Royal Society of Chemistry incorporates images and enhanced image metadata into some of its journal articles, primarily in enhanced image captioning, 3D imagery, and supplementary descriptors based upon a well-developed chemical nomenclature taxonomy.

The Inspec indexing service creates enhanced indexing options such as numerical range searching for data found within charts, graphs, and text materials, and enhanced indexing of materials not adequately described within image captions, but it does not use the full range of possible media enhancement add-ons.

ProQuest offers "enhanced abstracts" that provide additional descriptive metadata for captions and other embedded media elements within published paper and online materials.

Wiley is improving navigation within journals by enhancing the handling of static image structures (and certain chemical data). The SmartArticle options are now live on a number of chemistry journals. Features such as Compound Browser, a Chemistry Term Highlighter, Compound Index, Enhanced Abstract Page, Compound Record, and Chemistry Structure Search are early demonstrations of what is possible when enhancing image indexing and navigation. These techniques can also be applied to video and dynamic images.

FUTURE CONSIDERATIONS

If users determine that the technical and contextual enhancements offered by *JoVE* and similar platforms make video journals a viable publication tool, the next questions for the scholarly community and the industry to consider are these: How disruptive are these types of publication platforms? How easy will it be to modify existing discovery and delivery systems? Is it better to create entirely new platforms for video materials? Are these new capabilities scalable as individual products or better designed as shared tools? How easy will it be to integrate these new services into existing user devices?

How does one define success and value with these new video tools? Certainly, one way is to look at some types of added value that can be provided: search and delivery options that support dynamic visual simulations and powerful visualizations which are excellent teaching tools, the capture and replay of one-time events (i.e., dance, music, explosions, and chaotic interactions in both directions), and documentation of complex processes for easy playback and training at a distance. Many other discipline-specific added values can probably be identified with preliminary trials of video-based tools.

If significant value is found in video journals, is there enough value to make the investment in new tools and techniques worthwhile for producers, publishers, and researchers? How essential will these video elements be, and to whom? Will these capabilities only be significant for certain disciplines or purposes, and will it be enough of a critical mass to move the industry forward? How much natural resistance to change will exist on the part of producers and researchers, even if the value is demonstrated? How expensive will it be to accommodate such new options for individual researchers or their organizations?

Perhaps video journals will only gain central importance for certain fields, much as large datasets have initially only been important in certain disciplines. In such limited instances, perhaps the infrastructure for future video services will be developed as a nonprofit program such as GenBank, where there are shared responsibilities and costs. Or perhaps the commercial players will see a future profit and the video infrastructure will be developed as individual products or as part of shared commercial tools such as CrossRef. There are both pros and cons to developing these service platforms as either distributed or central repositories. But can a less-powerful version of video service be developed and supported if the video capabilities are only seen as supplemental?

> *JoVE* demonstrates that a peer-reviewed video journal service is possible, valuable, and ready for integration.

PROBLEMATIC IMPLEMENTATION

There are some key technical issues to be considered when incorporating a video journal into the existing publication paradigm. They include the adequacy of current network bandwidth when dealing with such large files to be distributed as normal peer-reviewed materials, considering already existing bottlenecks in local area networks. Supporting selected formats from among the many existing media options and agreeing upon some standards for various communities of practice is another issue, as is the degradation of image quality over networks and in classroom displays with lesser resolution and audio capabilities. Finally, future preservation strategies—emulation versus migration—of video materials over time as platforms, software, and system functionalities change must be addressed.

Access issues to consider include the adequate description of complex and multimedia components within a video stream; targeted segment access to subelements of materials within an initially serially created product; relational links to associated materials within other serial files; and ADA compliance for visually impaired researchers.

One other significant logistical issue for adoption and implementation will be the willingness to accept such video materials within the mainstream of existing peer review processes. New criteria will be necessary for video quality and standards. New methods of creating and transferring anonymous versions of materials for review will need to be developed. Revised editing and commenting options will also need to be developed and integrated into existing editorial and reviewing packages.

While this may seem far in the future to some, there are already examples of theses and dissertations that are submitted as almost entirely video materials. It is only a matter of time until some of these materials, or subsets of these materials, are submitted for peer review as is currently done with textual materials.

For now, *JoVE* demonstrates that a stand-alone video journal platform can be developed, and that basic indexing and delivery can be provided with existing tools. Implementation of a more robust system that takes advantage of additional video capabilities will require planning, resources, and commitment. *JoVE* demonstrates that a peer-reviewed video journal service is possible, valuable, and ready for integration. Will librarians and researchers find it desirable?

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