



Opinion

A Database for Peer-Reviewed Microscopy Images and Their Unpublished Brethren

Caroline Kane,¹ Timothy Mitchison,² Joan Goldberg,³ and David N. Orloff³*

¹ Molecular and Cell Biology, University of California, 34 Koshland Hall, Oxford and Hearst Sts., Berkeley, CA 94720-3202

² Harvard Medical School, Department of Systems Biology, 200 Longwood Ave., Boston, MA 02115

³ American Society for Cell Biology, 8120 Woodmont Ave., Suite 750, Bethesda, MD 20814

* dorloff@ascb.org

With the advent of the computer age and in particular, the Internet, information sources have multiplied. However, the need for information verification has never been greater. In a day when anyone can easily produce a website, blog, or tweet, you can't believe what you read or see just because it's "published." Scientific data and analysis require peer review, and peer-reviewed data need a home. Equally important, for every piece of data in a peer-reviewed publication, there are usually many pieces that provided essential support for the conclusions of the study but could not be included due to space limitations. This is especially true of image data, which are necessarily gigabyte-hungry.

Scientific progress requires the sharing of one's data. Sharing allows for validation, and increasingly, for drawing new conclusions from the same set of data using improved data mining tools. Although the field of microscopy has been growing at an amazing rate in terms of new imaging technology, it has been slow to take advantage of new technology in the area of data storage, dissemination, and public querying. Protein chemists and genomics researchers (as well as numerous other scientific specialists) have developed easy-to-access, publicly available websites to share their data and results. Many scientists have made discoveries that would have been impossible without aggregating smaller data sets. For example, it is now routine for researchers to compare the sequence of a protein discovered in their lab to the universe of known proteins or to analyze mass spectrometer data by comparing an experimental fragment spectrum to theoretical spectra obtained by computational processing of sequence databases.

Technology issues have impeded the development of image databases, but many advances involving processing speeds and data storage have eliminated these obstacles. Now there are many programs available that allow microscopists to view, share, and analyze their data online. What is lacking is a definitive online resource of images and movies. There is no question that when you sequence a gene, you submit it to GenBank. There needs to be a corresponding online resource, and the imperative to use it, for the multidimensional data of microscopy. This resource must be easy to use and should accept both published and unpublished images. It should also provide access to the original data set, be peer-reviewed, and be professionally annotated to provide robust searches.

Image creators and authors should be able to save their images in such a database to ensure reproducibility and availability for future analysis. This would be useful both for their labs and other researchers. Experimental questions unforeseen at the time the image was captured might be answered by additional analysis.

This image resource would be invaluable to the research community and to the public. Besides furthering scientific discovery, the resource would serve as a *de facto* microscopy outreach program. It is a tragic loss that so much valuable data—micrographs, z-stacks,

time series, and negatives—sit on hard drives and on desks buried by paperwork. Also tragic is that data from negatives, lantern slides, and 16-mm movies hidden in filing cabinets are also inaccessible. These data should be, and could be, shared. Where would genomic scientists be if their peers had not shared their sequences in GenBank?

Authors will always publish their best images in their articles, but why not provide all the supporting or sibling images in one searchable database? This resource would allow sharing, as well as archiving, of data outside an individual laboratory. It would solve two organizational problems that are near-universal in microscopy labs: retrieval of images generated by ex-lab members and implementation of image file naming and annotation conventions that allow multiple lab members to access the same data without confusion. Moreover, by implementing a common file format, it would circumvent the very real problem that every instrument and vendor seems to use a different image file convention. Microscopists share their data on a small scale already. A searchable database will allow and promote sharing to further scientific discovery. Publishers too should present or link to fully analyzable data sets for the images and movies published in their journals. What better place than a free, easy-to-access database that links to relevant articles, provides a common file format, and allows searching using a constrained ontology that matches that used by genomic databases?

For biology, and cell biology in particular, this resource now exists: *The Cell: An Image Library*TM. For this database to succeed, however, the input of the microscopy community is essential. The value of a repository of microscopy data will be fully appreciated only as its contents grow.

Please visit The American Society for Cell Biology's *The Cell: An Image Library* at www.cellimagelibrary.org. By contributing images, microscopists will increase the value of this resource. *The Cell* is young and growing rapidly. With readers' help, we can increase the diversity of its contents and its usefulness for research and education. We invite contributors to visit <http://www.cellimagelibrary.org/pages/contribute>. Professional annotators are at work, adding search terms and entering images and movies into the library. *The Cell: An Image Library* can be cited as a publication because images are peer-reviewed, and contributors are acknowledged.

Clearly, as in all sciences, the trend is to amass data from a field in one place in order to advance the field and encourage discovery. Now is the time for microscopy; the place is *The Cell*. Won't you play a part?

The ASCB welcomes feedback, including suggestions for the library's improvements, to dorloff@ascb.org. This project is supported by Award Number RC2GM092708 from the National Institute of General Medical Sciences (NIGMS), U.S. National Institutes of Health, to the American Society for Cell Biology.

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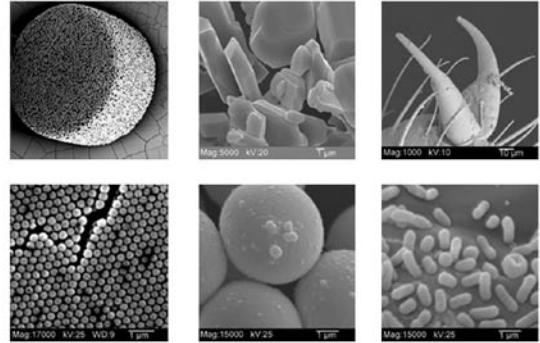
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