Science Careers From the journal Science

http://sciencecareers.sciencemag.org

Courtesy of Alan Marnett and BenchFly

Issues & Perspectives

YouTube at the Bench

As a graduate student at Princeton University, Moshe Pritsker tried in vain to grow a culture of embryonic stem cells from instructions laid out in the methods section of a journal article. A colleague with more bench experience tried and also failed. Finally, Pritsker flew to Edinburgh to visit the lab where the paper originated to witness the procedure in person. He learned that the cells and solutions simply had to be handled in a particular fashion. It was a small detail that the written procedure didn't capture. “Does one have to travel so far to learn these intricacies?” he recalls thinking on the flight home. “This seems medieval.”

Video cameras—including those in smartphones, laptops, and tablets—are handy, inexpensive, ubiquitous, and easy to use.

Courtesy, Moshe Pritsker

Moshe Pritsker

Problems of replication in science have gotten a lot of attention lately. It's a difficult problem. But for this one aspect of the problem—the challenge of providing precise and complete instructions for complicated and subtle procedures—a 21st century solution is at hand: Just train the camera on the bench to demonstrate how the experiment is done, Pritsker says. Video cameras—including those in smartphones, laptops, and tablets—are handy, inexpensive, ubiquitous, and easy to use. Video is better than text because some of the subtleties that must be employed in order to make a complex experiment work cannot easily be recorded on paper. Even a meticulous written record can be hard for the reader to visualize and reproduce. “There are so many cracks to fall through,” Pritsker says. “Instead of curing cancer and saving the world, graduate students and postdocs spend months reinventing the wheel.”

In 2006, Pritsker launched the ***Journal of Visualized Experiments* (JoVE) *(http://www.jove.com/)*** , a peer-reviewed journal that publishes written protocols accompanied by video demonstrations. Protocols are *JoVE*'s business; it is not, the journal's Instructions for Authors section says, a results-based journal. The focus is on experimental life sciences, but all are welcome; recently, the journal added an **applied physics (http://www.jove.com/ap)** category.

A video is worth a million words

Video allows researchers to **disseminate details of an experiment to a large audience (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1978087/)** with less ambiguity than written words. This was the experience of Edward Boyden of the Massachusetts Institute of Technology (MIT) in Cambridge, whose group developed a methodology to direct viruses to several locations in the brain. In vivo neuroscience techniques require lengthy surgeries and complex devices, with multiple parameters to consider at one time. “Everything about surgery is subtle,” he says. One **13-minute video (http://www.jove.com/video/1489/scalable-fluidic-injector-arrays-for-viral-targeting-of-intact-3-d-brain-circuits)** captured all those nuances for the intended audience. That *JoVE* paper has received nearly 20,000 hits so far.

Replicating experiments and communicating scientific results aren't the only areas in which video can excel. “There are also these tips and tricks you need to master in the lab to become a good researcher in the first place,” says Alan Marnett, founder of **BenchFly (http://www.benchfly.com/)** , a start-up company that helps researchers with the production and distribution of lab-related videos. Marnett majored in chemistry as an undergraduate, has a Ph.D. in chemical biology, and did a postdoctoral stint in neuroscience. In moving between disciplines, he says, he depended on colleagues to teach him techniques in each new field, one on one. He decided there had to be a more effective way to train scientists—and drew up a business plan.

Charles Knutson, a postdoc at MIT, realized he was providing the same training over and over to new students in his department, so he **uploaded two clips to BenchFly (http://www.benchfly.com/profile-public.php?u=145)** of a couple of standard biochemistry techniques that he had perfected. Video can't completely replace one-on-one training, Knutson says. It "doesn't eliminate the training, but it certainly streamlines the process."

A bonus for science is that biochemists beyond MIT can use those training clips. Open access is the rule, though BenchFly also provides a restricted access option and private accounts.

Lights, camera, action

BenchFly provides professional video production and distribution services to clients who need them, but contributing scientists produce most of their own videos. "The creator of the clip is the ultimate decider about what constitutes acceptable quality," says Knutson, who has no formal video training. "You don't need a big fancy camera; you can do your filming with a smartphone or a tablet. Video editing, too, is easy once you get the hang of it. ... Once you're up to speed you can edit down a video clip of 1 to 5 minutes in an hour or two, maybe even less."

The homemade aesthetic is welcome at BenchFly, but *JoVE* takes a more professional approach. When *JoVE* accepts a paper, they can send a crew to the laboratory to film the procedure; the company has relationships with videographers in many of the most scientifically important cities, and the network is growing, they say. Authors can send in self-produced footage, but it has to meet *JoVE*'s production **standards (http://www.jove.com/files/Media/AuthorProducedCriteria.pdf)** .

Courtesy of Alan Marnett and BenchFly

Alan Marnett

Currently, *JoVe* charges a $1200 "publication" fee for self-produced videos and $2400 if *JoVE* does the filming. (There's an added fee of $1800 to provide open access.) More often than not, *JoVe* contributors leave video production to the pros. At BenchFly—a posting service, not a peer-reviewed journal—videos can be posted for free.

Making yourself visible

Not every video needs to be posted online. Pascal Wallisch, a postdoc at New York University in New York City, presented the first **"podster" (http://www.sciencemag.org/content/314/5804/1365.3.full.pdf)** at the meeting of the Society for Neuroscience in 2006, when he was a graduate student. His poster was on visual neurons. Interested passers-by could watch bonus clips about different aspects of the experiment on his two iPods. Soon, the portable displays increased in size—so Wallisch has moved on to presenting "padsters," screened on iPads. The next step, he says, could be huge video screens that replace printed posters. "Basically, one can get all the benefits of a talk (where one can show videos) and a poster (being able to talk to the 'audience')."

Scientists are opening up to the idea that emerging technologies can revolutionize how ideas, results, and data are disseminated, Marnett says. A principal investigator's Web site, with embedded videos, could be the place to go to learn more about the lab's latest work. "A great deal of science doesn't look like much and doesn't lend itself to the video format—for instance, doing a survey or creating an online study. Some scientists who have been targeted by animal rights terrorists would probably not be comfortable with this either," Wallisch says.

But video is just right for presenting other types of data. Animations, or "movies" of molecular structures, are useful from a teaching point of view and for research seminars, says biophysicist Stephen Curry of the Imperial College London. "Compared to a static picture, you can see 3D molecules like those of a protein better on a flat video screen because it allows for change of perspective. You can see the same molecule from all sides."

Marnett believes that the use of video in scientific research is poised to go from rare to ubiquitous. That would be good for his business—but also for science, he believes. If he's right, in the future, scientists won't have to get on a plane just to get the nuances of a published protocol right.

Vijaysree Venkatraman (http://vijeejournalist.com/) is a Boston-based science journalist.

10.1126/science.caredit.a1200104

Cancel