



Raw data videos offer a glimpse into laboratory research

Roberta Kwok, *Science Writer*

In one video, a pair of detached butterfly wings slowly change colors from pale yellow to dark spots with splashes of orange. In another, a mouse explores a raised circular platform, peering at a checkerboard pattern on the floor below. A third clip shows a worm undulating in a funnel-shaped enclosure, bending tiny “pillars” with its body.

These videos are part of a collection of laboratory footage gathered by filmmaker Alexis Gambis and colleagues. Gambis, executive director of the non-profit Imagine Science Films (ISF) and founder of the online science film platform *Labocine*, both in Brooklyn, NY, has long been fascinated by the visual appeal of raw data clips. His organizations have showcased videos ranging from microscopic observations to computer simulations posted online and shown at science film festivals and exhibits. In July, *Labocine*, which first started in 2016 as a subscription-based video magazine

and online database of science cinema, launched a collection called “Scenes” on its website to highlight raw laboratory footage.

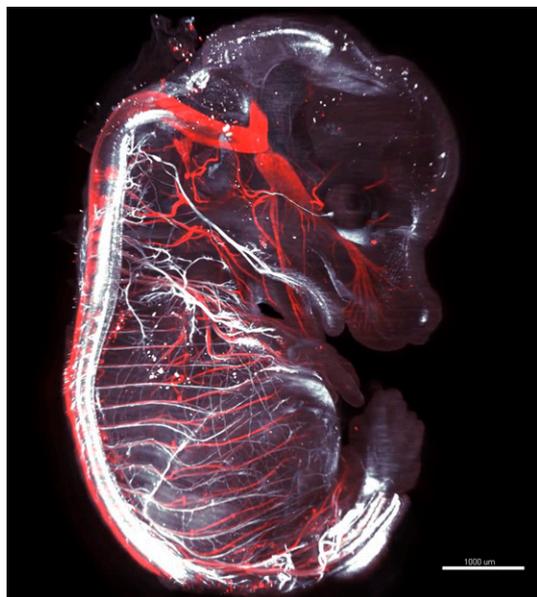
Gambis, a former geneticist, says the videos offer an intimate glimpse into a world that is often obscured from the general public. “They get a palpable view of what’s happening in research today,” he says. And the raw footage is a departure from traditional science documentaries, which are heavily edited and typically use voice-over to describe scenes. “It’s oftentimes so chewed-up and explained to you,” Gambis says. The laboratory videos he and his team gather come with minimal information and often without sound or music. They provide a more purist experience, he says—a sort of scientific *cinéma vérité*.

Researchers who participate see an opportunity to share content that would otherwise stay buried in supplementary materials or computer hard drives.



An example of raw laboratory footage with aesthetic appeal, this image was taken from a time-lapse sequence of squid development documented by developmental biologist Nipam Patel and his students. It won runner-up for the Scientific Merit Award at ISF’s New York film festival last year. Image courtesy of Nipam Patel (University of California, Berkeley, CA).

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In July, *Labocine* launched a collection of laboratory footage called *Scenes*. **Movie S1** shows a 14-day-old mouse embryo's motor nerves (in red) and sensory nerves (in white) from various angles. Image courtesy of Nicolas Renier (Institut du Cerveau et de la Moelle épinière, Paris).

Developmental biologist Nipam Patel has given ISF and *Labocine* clips of animal development featuring the buckeye butterfly (*Junonia coenia*), African clawed frog (*Xenopus laevis*), and longfin inshore squid (*Doryteuthis pealeii*). "We do things that are so visually stunning," says Patel, who's the incoming director of the Marine Biological Laboratory (MBL) in Woods Hole, MA. "The more people that see it, the better."

Surrealist Images

Gambis's interest in laboratory footage stems from his experience as a PhD student at Rockefeller University in New York. There, he investigated how fruit fly neurons respond to stress. As he worked late at night making videos of green and red fluorescently tagged proteins in fly retinas, he started to see them as "very abstract and very surrealist," he recalls. That made him think of the other videos created by researchers that rarely reach the public. "What if we were to actually treat all of this content that's coming from labs almost as small films?" he wondered.

Gambis decided to do just that when he started running a weekly science film series on campus—works such as *Naturally Obsessed: The Making of a Scientist*, a documentary about a laboratory's efforts to determine a protein's structure, and *Dark Matter*, a drama about a physics graduate student's unraveling. Between movies, Gambis showed clips from the university's laboratories—say, a nematode in a petri dish or zebrafish behaviors. In choosing these videos, he didn't think much about the scientific content. Instead, he asked himself: "What is something I would want to watch for 30 seconds or a minute?"

Gambis went on to pursue filmmaking; his first feature film, *The Fly Room*, explored the relationship

between geneticist Calvin Bridges and his daughter. ISF, funded largely by grants and donations, runs annual film festivals in New York, Paris, and Abu Dhabi that show everything from documentaries to experimental movies. Part of the mission is to "treat scientists as filmmakers," he says. Although researchers often act as consultants on movies, they're rarely seen as filmmakers in their own right. But in the course of their research, they are in fact making filmmaking decisions, such as selecting lighting and figuring out how to crop videos, Gambis says. His team looks for laboratory footage by putting out calls for submissions on social media and trawling Vimeo and laboratory websites; the clips are shown at ISF film screenings and accompanying exhibits. ISF events at various locations attracted a total of about 3,700 attendees last year, and *Labocine* currently has about 1,400 subscribers.

The raw data videos reflect what is happening right now in research, says Nate Dorr, ISF's director of programming. For instance, in 2014, the festival included footage of a plant-root-tip regeneration experiment that had been done shortly before the event. It was "straight out of the lab," Dorr says.

The clip submission process is not, however, immune from the competitive culture of science. Some researchers hesitate to share unpublished videos, fearing rival laboratories could see ongoing experiments. There is a tendency "to hang onto your data really closely," Dorr says. But he argues that not every piece of data is vital, particularly if only a short clip is released. "You can create a window into what you're doing without giving anything away," he says. Many researchers seem happy to oblige—so far, *Labocine* contains about 1,000 laboratory videos in its collection of roughly 3,000 movies.

The researchers hold the copyright to their videos, and they can choose how long the clip is shown.

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—Nate Dorr

(*Labocine* archives indefinitely unless the researcher requests otherwise.) But all laboratory footage included in *Labocine*'s "Scenes" will be open-source, allowing anyone to reuse the material.

Like many of the contributors, Patel had a trove of videos. As part of his embryology course at MBL, he and his students filmed animal development with high-quality cameras. But the videos weren't necessarily publishable in scientific journals. "I had terabytes of all of this very pretty data but nothing to do with it," he says. "I always thought, well, it's sad that it doesn't see the light of day." For an outreach event at the University of California, Berkeley, Patel put together a time-lapse sequence of clips of squid embryos developing, interspersed with confocal microscope images of the animals (see <https://www.labocine.com/film/1448>). ISF showed the video at its New York film

festival last year with just a one-sentence description in the program. It won runner-up for the event's Scientific Merit Award. The clip also has been played about 1,200 times on *Labocine* and more than 11,000 times on Vimeo.

In some cases, the videos give people a more realistic view of experiments than, say, news coverage or documentaries. Last year, Andrew Straw, a neuroscientist at the University of Freiburg in Germany, provided *Labocine* with clips of mice, fish, and fruit flies in a virtual reality (VR) system that aims to investigate how animals respond to certain environmental stimuli (see <https://www.labocine.com/spotlight/125>). Images are projected on the walls and floor of an enclosure, and cameras track the animals' movements. "Basically, we put animals in computer games," Straw says. A news crew also filmed the fly research in his laboratory. But the reporters visited in the middle of the day, when fruit flies aren't very active, and opened the window shades to let in daylight, which might make the tracking system perform poorly. So he programmed a virtual fly to circle the enclosure instead. "It was totally staged," he says. The videos on *Labocine*, meanwhile, show real experiments of animals navigating their VR environments.

Historical Throwback

The idea of showing raw data videos to the public isn't new. In the late 1800s and early 1900s, people watched short movies on scientific topics such as bacteria or plant growth in theaters. "The use of raw lab footage for entertainment actually goes back almost to the beginning of cinema itself," says David A. Kirby, a science communication researcher at the University of Manchester in the United Kingdom. The silent 1903 short film *Cheese Mites*, for instance, shows the microscopic critters scurrying around a man's lunch. *Labocine* videos evoke that earlier time by embracing the idea that "there is spectacle in scientific data; there is beauty," Kirby says.

But the videos also fit in with today's fast-paced social media landscape. Because they're short, they "satisfy the desire for instant gratification," says Imogene Cancellare, a wildlife biologist and science communicator at the University of Delaware in Newark, DE, who runs the popular Instagram account @biologistimogene. Unlike many other science videos on social media, Cancellare notes, the clips usually don't show the researchers. Instead, the viewer simply sees what the researcher sees, "as if I am the scientist," she says.

Gambis's next project will bring the public even closer to the researcher's perspective. This year, he plans to set up live video feeds at microscopes in laboratories around the world. *Labocine* viewers will see exactly what the researcher is seeing in real-time, something like the "critter cams" that monitor wild settings, such as Alaskan streams with bears swiping at salmon or bird nests hosting new chicks. The public is engrossed by those live videos, says Cancellare: "It becomes addictive." Although bacteria might not be as charismatic as baby eagles, it's possible that viewers could get hooked on microbial spying too. People are interested in "the secret goings-on of the things around them that aren't part of their everyday lives," she says.

Ultimately, brief glimpses into laboratories might inspire some people to seek to learn more, Cancellare says. If they watch a clip of butterfly wing development, they might google the topic, pay closer attention to the butterflies in their yard, or become concerned about the animals' conservation.

But these short films also can stand on their own as art and entertainment. Monica Zoppè, a biological visualization expert at the Institute of Clinical Physiology's Scientific Visualization Unit in Pisa, Italy, says she would like her team's videos of computer-simulated cellular processes to inspire interest in the topic. But, she adds, "if they just spend five minutes and enjoy it, that's just as good."