VISUALIZING SCIENCE: HOW TO TURN RESEARCH INTO VISUAL MEDIA

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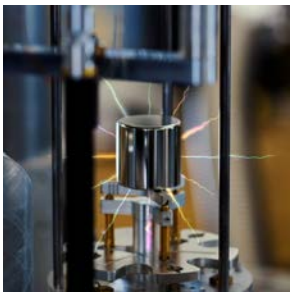
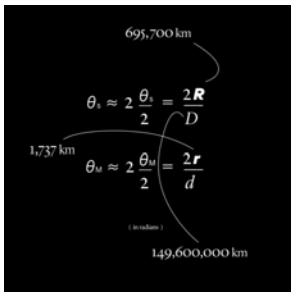




INTRO

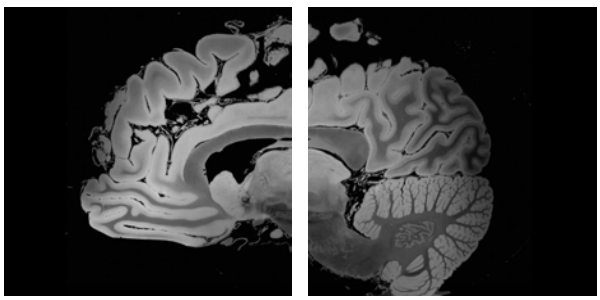
A lot of research grants have media and science communication requirements. For example, “broader impacts” associated with National Science Foundation funding.

Useful primers provided by the NSF:

- Broader Impacts Overview
- Broader Impacts 101

Having worked on media strategies with scientists over the years, I’ve seen first hand what a dynamic multimedia and science communication plan in a funding proposal can get them: mainly, awarded grants. Also, before you ever even write a grant, having a demonstrated history of compelling SciComm—whether it’s making YouTube videos, posting to Instagram, TikTok and Twitter, or producing a podcast—will only make you that much more likely to receive funding, no matter when you apply. Perhaps more importantly, developing your SciComm skills can lead to greater awareness of your work, sharpen your communication skills, generate discussion within your scientific community, and possibly create opportunities for collaboration.

Ten or twenty years ago, a scientist's media plan often promised twitter threads or Wikipedia style web resources. But, increasingly, many scientists are now amazing photographers, filmmakers, designers, and podcasters. It’s no wonder. Through your work as a scientist, you’ll often find yourself in worlds the rest of us can only see in a *Planet Earth* documentary. You have high powered microscopes. You create machines that float in space. A 100 micron resolution MRI brain scan might be integral to your research, but it’s also something no animator could ever make on their own.



Edlow, Brian L. et al. (2019), Data from: 7 Tesla MRI of the ex vivo human brain at 100 micron resolution, Dryad, Dataset, https://doi.org/10.5061/dryad.119f80q

When I got a chance to photograph a cheetah in the wild, I looked through my camera roll and thought, “I bet it’s hard to take a bad picture of a cheetah.” To be sure, a great photographer is a great photographer. But, in my opinion, what often separates a National Geographic photographer from everyone else is access (having a budget, of course, helps too).

Cheetah in Serengeti National Park, 2018

As a scientist, you often have that access built into what you do. So, if you think you can’t take a good photo or record an interesting video, you’re in luck—your subject matter, your field of research, is probably pretty cool looking. Kibble balances look like time machines. Pond scum under a microscope is one of the more beautiful things on Earth. And a cheetah, even if it just ate and is covered in blood, never looks bad. So, take that picture. Record that video. The USGS Bee Inventory on Flickr is one of the best SciComm projects I’ve ever seen—and it’s just a static image database.

Whether you’re trying to secure funding or trying to get your work covered in the press—or simply trying to communicate your science because science is for everyone (and not just for publication in a journal)—making and providing engaging SciComm multimedia has never mattered more.

What follows is a brief video primer for scientists and students alike that fall somewhere between multimedia novices and phone camera pros.

USGS Bee Inventory and Monitoring Lab

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CREATING MEDIA ASSETS

No matter your skill level, you can document your work with a modest media production kit (keep reading for equipment suggestions in a minute). What follow is a guide to making that happen, but as you're working keep in mind a few questions about what stories could be told with this content:

- Does it capture your imagination?
- Show strange structures or behaviors?
- Shed new light on an old debate?
- Relate to another field like art or economics?
- Help inform decisions in our daily lives?

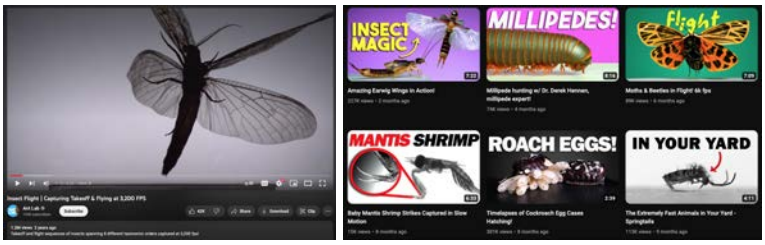
Examples of simple but effective media you can make:

- Lab timelapses (low-fi) (hi-fi) - So much of science is invisible. It's numbers. It's gasses. So, how do you show that? If your field of research doesn't include animals or rockets, fear not. Sometimes simply showing your labspace can be enough. My favorite shoot of all time was in the basement labs at the National Institute of Standards and Technology.
- Nature camera traps (video) (interesting project)
- In the field photos and videos (Voyagers Wolf Project on Instagram)
- In the lab photos and videos (ParticleClara on TikTok)
- Photos and videos through the lens of your microscope (Biologist Sally Warring's Pondlife Instagram, which later turned into a video series)

Screenshot from @pondlife_pondlife's Instagram account

How your media might be used:

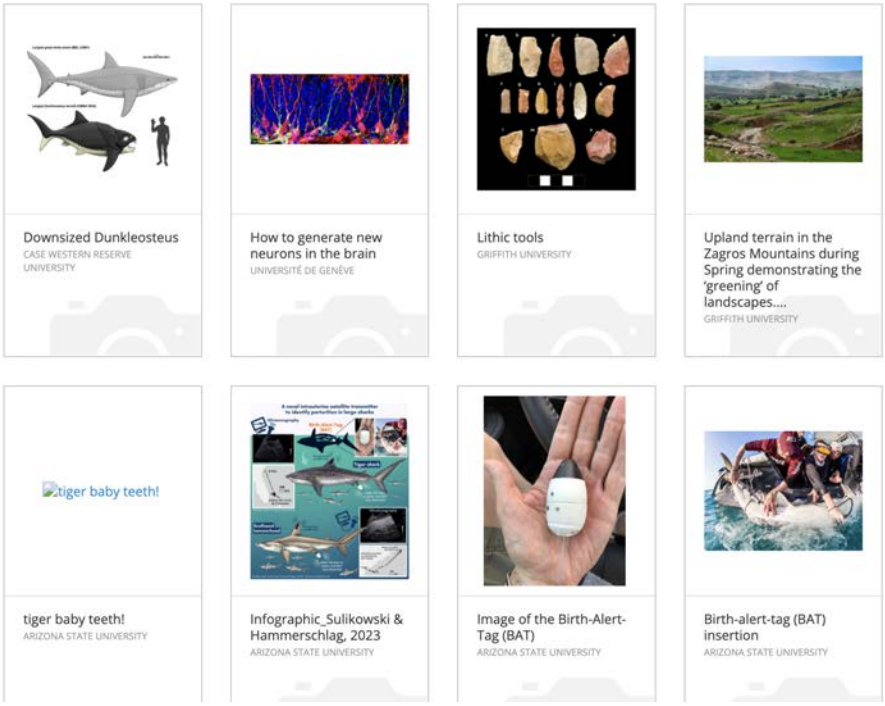
- Seeker by The Verge on Instagram is an excellent example of the kinds of media scientists are producing. Not only that, but the kinds of media that the members of the press are interested in profiling and highlighting—because the majority of the social videos science news organizations produce and share are created primarily with scientist-made media.
- Biologist Adrian Smith's Ant Lab on YouTube is an awesome example of a scientist turning their research into SciComm for everyone. As a cameraperson myself, Smith uses and has access to equipment I could only dream of.



Screenshots from Ant Lab on YouTube

WORKING WITH YOUR SCIENCE COMMUNICATION COLLEAGUES

After years of work, your research will hopefully be published in a scientific journal. Your science will also likely find its way to press release aggregators like AAAS's EurekaAlert! Give their multimedia page a look. Sometimes having a compelling image, infographic, or video clip that pops on this feed will be the difference between getting your years worth of research covered in the New York Times' Science page or not. For example, on any given day, more than half of the lead images for their Trilobites column is supplied by scientists or science communication staff. Of course, all the research profiled is interesting. But, because internet news lives and dies on images and video, the scales might tip in your favor if a reporter is picking between fascinating research with multimedia and fascinating research without.



The multimedia feed on AAAS's EurekaAlert!

A resource that's often underutilized or ignored by scientists is the science communication team at their universities, labs, research institutes, and museums. Being a scientist is a lot of work. Afterall, research comes first. Depending on where you are, you very likely could have an ace in the hole in a SciComm multimedia producer or communications manager. Other types of organizations and institutions might have science writers you can collaborate with. For example, the Field Museum's Brain Scoop project filmed with in-house researchers, and Columbia's Climate School has great writers on staff. Whatever the situation, the trick is to work with these folks early and often. They can help write grants. They can assist with broader impact plans. They can document your work. They can create multimedia projects out of your research. They can get your science noticed.

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Amazing SciComm projects made by comms staff:

- The National Institute of Standards & Technology's SI Redefinition microsite (one of the best collaborations between comms staff and scientists I've ever seen)
- UNC Research's Endeavors
- The American Museum of Natural History's *Shelf Life* project
- University of California's *Fig. 1* project
- Cal Academy's *bioGraphic*
- University of Florida's *Becoming Visible* project

(Left to right) UC's *Fig. 1*, Cal Academy's *bioGraphic*, AMNH's *Shelf Life*

Of course, the real trick is having colleagues as well as the institutional investment to pull off projects and collaborations like this. Which, oftentimes, is easier said than done. Still, the only way to find out if projects like the above are possible is to reach out and talk with your SciComm coworkers.

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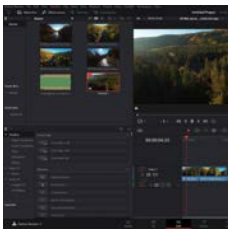
SIMPLE MEDIA KIT: OVERVIEW

If you're looking to turn your science into media, consider the following tools as a starting point. If anything here sounds useful, research what brand fits your budget and makes sense for you. In the next section, I'll do a deep dive into camera equipment. If you have any questions, please reach out. I'm at thomas.r.mcnamara@gmail.com.

				
Clip on macro lenses for your phone can improve any field photograph.	GoPros are great for setting up lab timelapses.	A steady shot is one of the most important things in filmmaking—they even make tripods for your smartphone.	Then again, not all science stands still. A gimbal mount for your phone can steady any handheld shots—this can give a real pro look to anything you film.	The next step up from your phone camera on a gimbal is a built-in camera-gimbal combo.

				
They make microscope camera adapters for your phone and pro-cameras alike.	If you think about it, a lot of science happens on tabletops. So do a lot of YouTube videos (think unboxing content). Because they make overhead table mounts for your phone, try setting something like this up for your next dissection or lab experiment.	Light sensors and color correction technology on your phone is so advanced now that even if you're in a lab with a few burned out lightbulbs, you can probably get away without having to buy additional lighting equipment. Then again, they make pocket lights like the example in the photo that can come in pretty handy. I've also used camping headlamps to light entire shoots at night or in caves.	Using your phone's audio jack or lightning port, you can attach pro level microphones. Costs can vary—same goes for your audio needs—so you should also consider the pro level option for audio, especially because clear audio can really make or break any media project. Here's a pretty affordable option from Zoom.	I edit video on Adobe Premiere. I edit audio on Adobe Audition or Avid's Pro Tools. If you are a student or work for a university, it's very likely you'll have access to this software for free or at highly discounted prices. I always recommend learning on the industry standards—it's pretty straightforward and you'll save time in the long run. If cost is an issue, look no further than the free DaVinci Resolve software.

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VIDEO EQUIPMENT OPTIONS FOR SCIENTISTS: IN-DEPTH

All three cameras outlined below have great image quality at medium range in good lighting and ultimately, I think you could make good videos with any of them. Here's a helpful comparison video.

DJI Pocket 2 Creator Combo

Without knowing more about budget or what types of things you'll need to shoot, this is my top recommendation. Only reason to avoid this camera is if you'll need very good close-ups (and it's admittedly more expensive than the GoPro).

PROS

- Creator Combo comes with very good wireless mic
- Built-in zooming function while you're shooting video (GoPro can't do this)
- Best of all models for low-light shooting

CONS

- Not great at close-ups
- Image stabilization not quite as good as GoPro (but still really good)

Sony ZV-1 Digital Camera (w/ Vlogger Accessory kit) or **Sony ZV-E10 Mirrorless Camera (w/ Content Creator kit)** (*similar models*)

Best option if most of what you're doing would be talking to camera on a tripod and shooting close-ups.

PROS

- Best option for close-up shots
- Best audio quality from built in mic

CONS

- Most expensive of the batch
- Worst image stabilizer on this short list (hence, this is a better camera for static, tripod shooting)

GoPro HERO 10 Black

I really think of this camera more for action/outdoors shooting, but it is undeniably the cheapest of the lot. If you decided to go with this, I'd recommend an external mic, which would add appx $60-$200.

PROS

- Great image stabilization if you're wanting to move around handheld
- Great cost point (and the HERO 9 and HERO 8 are even cheaper!)
- Great for timelapses

CONS

- Terrible at close-ups
- Poorest audio quality
- I find it awkward to hold without a grip. (Which, of course, you can buy separately.)

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IF YOU'RE READY TO BE A STAR

The above examples and sample kits are starting points for capturing the world of your research. If you're comfortable being on camera, here are a few extra tips for recording yourself:

- Audio quality matters: If people can't understand what you're saying, they'll scroll on past. Make sure your microphone can hear you, so that your audience can!

- Explain any technical vocabulary. Don't think of this as avoiding jargon. Cool new words and concepts are fun to learn—just make sure you explain them. Share your script or explanation with someone not in your field and if any words are unfamiliar, think of short ways to explain those things. E.g., "When a researcher thinks they have a new species, they need to pick out a single specimen that's going to represent that species for all time. We call that a holotype."

- Be yourself! Get comfortable before you hit record. Reading a script will come across as reading a script. This is stuff you know about, so have your talking points in hand, but try and do at least a couple of takes where you just speak conversationally, rather than worry about hitting every note perfectly. That's what editing is for!

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EDITING

There are plenty of simple video editing tools out there. YouTube, Instagram, and TikTok allow you to edit in-app. As mentioned earlier, DaVinci Resolve (free) and Adobe Premiere (discounted for students) are great options.

LinkedIn Learning—which is available free through NYPL and other libraries—offers tons of courses on video production, editing, animation, etc.

LinkedIn Learning

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ACCESSIBILITY

Viewers are increasingly consuming videos with captions turned on. Adding captions makes content accessible to a much wider audience, and I've found they help underscore concepts that you may be explaining on screen.

Most social media platforms—e.g., YouTube—have captioning abilities available. Make use of them and don't rely on auto-captioning. Particularly when it comes to science, you don't want YouTube's less-than-rigorous bot to turn Boyle's Law into boiled slaw.

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MORE READING

- Rebecca L Coates, et al. PhysFilmMakers: teaching science students how to make YouTube-style videos. *Eur. J. Phys.* December 18, 2017. *(Particularly check out Section 4.4 B-roll sessions to spark some ideas!)*

- Paul Hitlin and Kenneth Olmstead. User engagement with posts on science-related Facebook pages is more common for visual posts, calls to action. Pew Research Center. March 21, 2018. *(Visual communication draws eyeballs.)*

- Neil A. Lewis, Jr., Jay J. Van Bavel, Leah H. Somerville, June Gruber. A social media survival guide for scientists. Science.org. November 5, 2018. *(Some good reminders here about keeping the long view in sight and the dark side of internet scicomm.)*

QUESTIONS?

If you have any questions, please feel free to reach out to me at thomas.r.mcnamara@gmail.com. I've kitted out scientists for in the lab and in the field video projects. I've helped scientists develop media plans for successful grant applications. I make all kinds of science multimedia. More than anything, I love working with scientists. Just give me a shout. Always happy to help!

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