So you want to be a science writer

John Fleischman and Christina Szalinski
American Society for Cell Biology, Bethesda, MD 20814

ABSTRACT **The Internet destroyed the ecology of traditional science journalism, drying up ad revenues and pushing "old school" mass media toward extinction. But the new technology opened a wider landscape for digital science writers, online "content curators," and scientists to chronicle the wonders and worries of modern science. For those thinking of a career in science writing, here is a flash history, a quick overview, some advice, and a few cautions.**

Monitoring Editor
David G. Drubin
University of California, Berkeley

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A FLASH HISTORY OF SCIENCE WRITING

Long, long ago for an event far, far away, *Newsweek* magazine sent its lowliest "stringer," a by-the-day freelancer, to cover the Mariner 10 satellite's "fly-by" of Venus. Fortunately, the press conference was not on Venus but at the Jet Propulsion Laboratory (JPL) in Pasadena (Kremer, 2014). Like all stringers and nearly all staff reporters at the time, the freelancer had no special science background and knew little about Venus beyond its position, second from the sun. The JPL team though, headed by Bruce Murray, were ready for an auditorium of "general assignment" reporters, some of whom were a little shaky even on the "second from the sun" part. Murray's team poured on the background—the surface temperature of Venus was more than 800°F/450°C under a thick, opaque cloud layer of sulfuric acid.

After unveiling Mariner 10's first-ever UV pictures, which revealed the planet's swirling atmosphere in detail, the JPL panel took questions. A television reporter popped up in his best blazer, microphone flag, and booming baritone to ask, "So, doc, when will Man walk on Venus?" The JPL panel was speechless for a long moment. Then Murray gallantly fielded the question, quickly walking the reporter back through the killing temperatures and sulfuric acid clouds to a chuckling conclusion that a Venus walk was some ways off. Ah, the good old days in science journalism.

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Address correspondence to: Christina Szalinski (cszalinski@ascb.org).

Abbreviations used: AAAS, American Association for the Advancement of Science; HMS, Harvard Medical School; JPL, Jet Propulsion Laboratory; MBL, Marine Biology Laboratory; NASW, National Association of Science Writers.

Before the 1960s, science news was largely technical writing for "trade" or specialized journals. The "mass" media often relied on uncritical reports of medical "miracles," technological "wizardry," and uniform scientific "progress." Yet things were changing. Because of the "race to the Moon," there was a corps of "space" reporters scattered about the JPL auditorium (whose questions, the stringer quickly realized, were the important ones). By the 1970s, big newspapers and the television networks were assigning a few generalist reporters to a permanent science "beat" that covered everything from asteroids to zygotes. The trades such as *Science* magazine hired journalists in the mid-1960s to write science news for nonscientists. In the mid-1970s, *Science* editor Allen Hammond made a daring decision to hire science PhDs to write a research news section (from an interview with Richard A. Kerr, *Science* magazine staff writer, interviewed March 27, 2014, by J.F.). Hammond figured his PhDs could learn science writing on the job. The new science media began tackling complicated science stories such as pollution, smoking, organ transplants, and recombinant DNA.

Thus began the golden age of science writing, which was not all gilt and not all that long. In the 1980s and 1990s, "serious" newspapers and the television networks added science and health correspondents. Degreed scientists and even physicians were on camera and on staff to provide perspective on the news. Newspapers added weekly science sections. Glossy monthly science magazines exploded with computer ads. Then, in the late 1990s, the Internet spread its wings and advertising flew away from print and broadcast television.

Thus began the free fall age of science writing. Ninety-five American newspapers had weekly science news sections in 1989. In 2005, there were 34, and in 2012, 19 (Morrison, 2013). The page counts in monthly science magazines fell like autumn leaves. Out went network television science reporters. Today, Americans are as

likely to get science and technology news from the Internet as from television (National Science Foundation, 2012).

SCIENCE WRITING TODAY

And so we come to the current age of digital science writing. The Internet, which took away so many professional outlets (and jobs) for journalists, opened a far wider landscape for online science writers, "content curators," and scientists themselves to chronicle the wonders and worries of modern science. They populate a brave new ecosystem of websites, blogs, e-pubs, and even "bijou" print issues about science. We talk about science writing, but digital science communication now involves creating videos, podcasts, animations, slide shows, and "whiteboard" lectures, while stoking the powerful social media engines that drive it all at the moment. This brave new world of digital science writing recalls the description by psychologist William James of a newborn's perception of the world as "one great blooming, buzzing confusion" (Hawks, 2010).

Finding a career path through all that buzz and all that confusion is not for the faint of heart. There have never been so many places to write about science. It has never been harder to find a well-paid, stable position where a science writer has the resources, including time, to explore complex modern science stories. The digital age has blurred (or, some say wiped out) the line between independent journalism, public information, public relations, and private interest. Some say good riddance. Some say beware.

Here to give some perspective on science writing in the Digital Age, we offer two views—old school (J.F.) and new school (C.S.). We'll explain who we are, how we got started, the paths we followed, the paths we think others might consider, and where we think science writing is going.

NEW SCHOOL—CHRISTINA SZALINSKI: HOW I GOT STARTED

I earned my PhD in cell biology and molecular physiology in 2013 at the University of Pittsburgh, where I researched endocytic and exocytic traffic. Toward the end of grad school, a career-planning course helped me realize that I would not be fulfilled following the traditional path to a postdoc. It was clear to me that writing was what I wanted to do. I had been blogging for years and enjoyed writing in the lab more than doing my experiments. However, I knew I needed to be doing more outside the lab if I was going to have a shot at leaving academia.

I quickly enrolled in a graduate-level, nonfiction writing course in the English department. It was a night class that met just once a week, so I could squeeze it into my schedule without disrupting my time in the lab. At first, I felt very out of place in the course. I was the outsider intruding on a tight-knit group of master's of fine arts students, plus I didn't know the jargon. On the first day, when the professor said to look at the "third graph," I was puzzled for a moment, as the handout had no figures, before I realized he meant "paragraph." It was a steep learning curve, but my classmates and professor were patient with my ignorance. Meanwhile, the heavy assignment schedule quickly pumped up my writing skills. The following semester, I took a formal journalism course with the same professor, who'd become a mentor and who helped me learn the journalism ropes. Eventually, he offered to serve as a job reference. I also participated in the mentorship program organized by the National Association of Science Writers (NASW) at the American Association for the Advancement of Science (AAAS) meeting. The NASW science writer I was matched with gave me great advice as well.

Six months before my planned dissertation defense, I started applying for science writing jobs and internships. I was lucky that the ASCB, of which I was a member, was looking for a PhD cell biologist to write for them. Although I interviewed for other opportunities, the position at ASCB seemed like a perfect fit, and I'm glad I took the position. I have quite a bit of freedom in deciding what I want to write about, and I enjoy having other job duties, like managing social media and supporting the student and postdoc committee, to break up my day.

Microscopes inspired one of my favorite stories thus far (Szalinski, 2013). I learned about Hari Shroff's new diSPIM technology while visiting the Marine Biology Laboratory (MBL) in Woods Hole. With his National Institutes of Health lab a few blocks away from the ASCB office in Bethesda, I went for a visit. Seeing his lab and interviewing him there gave me details I wouldn't have discovered over the phone. I was fascinated—and taking notes as fast as I could—as Shroff explained how his sprawling experimental arrays of lenses and mirrors might someday be built commercially as a compact microscope unit that could put new advanced imaging technologies in labs around the world. Back at the keyboard, the challenge is always to translate complex subjects, like diSPIM microscopy, into clear descriptions and accurate explanations.

OLD SCHOOL—JOHN FLEISCHMAN: HOW I GOT STARTED

I wrote about a blackout. It took place in the small Ohio city where I had my first job as a very general assignment newspaper reporter. For the daily, I covered school boards, train wrecks, the "cop shop," basketball, obituaries, hog prices, and anything else that crossed the city editor's desk. When the electric power to the entire downtown went out 10 min before press time, he dispatched me to find out why. At the central distribution yard, I found a very unhappy engineer surrounded by linemen in bright yellow vests awaiting orders. Gradually, I learned that the way you fix a blackout is to disconnect all quadrants of the local grid and hook them back in, one by one, waiting for one to blow. Then you disconnect that one, take down all its subcircuits, and put them back on, one by one. And so on. Two days later, I was summoned to the managing editor's office. He'd had a letter from the power company. I swallowed. They wanted to use my blackout news story in their training materials. Not bad, I thought, for an English major.

I wish I could say that I threw myself directly into science journalism. Instead, my writing career took me this way and that, from newspapers to magazines, briefly (very) into public radio, and then back to magazines. Along the way, I worked for a psychology magazine, learning to read paper abstracts and to interview behavioral researchers, asking them to disconnect the central finding and plug it back in, premise by premise. Over time and for other magazines, I found myself writing about forest ecology, ichthyology, astronomy (Mariner 10!), mass extinctions, geology, SETI, urban zoology, printing technology, glaciology, classical Greek archaeology, and aviation history (i.e., old airplanes).

I shied away from straight bioscience stories until I was accepted for a science writing program (now called the Logan Science Journalism Fellowship) at the MBL in Woods Hole. It was a hands-on lab course, staffed by enough graduate students to keep me and my fellow journalists from harm at the bench. I kept a lab notebook. I learned to use a Pipetman. I heard the radiation safety lecture. My bench partner and I produced the world's most twisted electrophoresis gel (it drew a crowd of grad students from other labs who'd never seen anything like it). I met my first ASCB members, Rex Chisholm and Bob Palazzo, who ran the course. Ten days in a lab is not five years in grad school, but the MBL program opened my eyes to the cellular world. It also extended my "idiot's license,"

something all journalists carry, allowing me to ask idiot questions about cell biology, such as, What is a microtubule? How do you spell your name? What is cumulative haploinsufficiency?

After Woods Hole, I wrote magazine stories about the Framingham Heart Study, the JAX lab mice from the Jackson Laboratory, and a historic case in brain science that modern neuroscientists can't leave alone: the fate of Phineas Gage, the railroad construction foreman who in 1848 had a 13-pound tamping iron shot through his frontal cortex and lived another 11 years. His skull and tamping iron ended up at the Harvard Medical School (HMS) where, interestingly, I ended up as well, although I was in better shape. At HMS, I was finally given the title of "science writer," while I filled in for a regular staffer on a six-month medical leave. Writing hardcore molecular and cell biology stories for the HMS fortnightly newspaper was a crash fellowship in cell science. Armed with my idiot's license and access for the first time to PubMed, the HMS experience set me up to become the ASCB science writer in 2001.

It was a good time to escape traditional science journalism, as the accelerating impact of the Internet was killing off one outlet after another. The ASCB also put me on the other end of the equation: with fewer science journalists writing about basic research, how do we tell the stories the wider world should hear about discoveries, about disease mechanisms, and about cell biologists themselves? That answer is still evolving, but for those on the research side, the technologies seem to be running our way. There are so many more ways to tell science stories today, and cell biologists can tell their own.

This is an exciting time to be a science writer. Old school journalism was stodgy, slow, and insanely hierarchical. It was hard for a newcomer to break into. It was hard to get new ideas into print or onto the air. It's hard to imagine such a rigid system keeping up with the speed of science today or the sophistication of a public who have instant access to scientific literature and often to the scientists themselves. And, best of all, Science Writing 2.0 is still being invented.

OLD SCHOOL AND NEW SCHOOL TOGETHER: WHAT WE DO AND WHO WE WRITE FOR

As the communications staff at ASCB, we are in a permanent beta phase for new platforms that can tell stories about basic cell research, both for insiders, ASCB cell biologists, and for outsiders, the public. Our latest effort is the ASCB Post (ascb.org/ascbpost), which carries science news, commentary, and career advice. Integral to the Post and the other ASCB website pages are our social media efforts, which push traffic toward ASCB pages but also point outward, so our followers also look to us for leads to interesting stuff elsewhere.

To feed this effort, we keep abreast of what's going on in science labs and in science policy. We look for stories worth telling, research their background, and interview the experts. Especially in reporting on research news, we try to write for people who aren't scientists or at least aren't scientists in our field (i.e., explaining mitochondria to physicists, explaining mitochondria to people with mitochondrial disease, and so on). A great feature of online writing is that we can post URL links to the original paper or our sources. The ASCB Post story doesn't have to be all things to all people, only accurate and accessible. ASCB also works to interest science journalists and bloggers in new basic research, new fields, new concepts, new mechanisms, and new connections to human health. To that end, we produce a "peer-selected" "Novel & Newsworthy" press book of research to be presented at the annual meeting. We also write traditional "press releases" for science news–posting sites such as EurekAlert! and create support materials for ASCB public outreach and science education efforts.

GETTING INTO SCIENCE WRITING

For those looking to get into science writing, here are some things you should be doing to prepare:

- Read the major science news outlets like the *New York Times* science section, *Scientific American*, and the front news parts of *Nature* and *Science*, plus new digital–print hybrids like *Nautilus* and *Pacific Standard* or pure digital like *Mosaic* and *Medium*. Notice what the writers are doing in their articles, how they bring you in, the metaphors they choose, and how the story is organized.
- If you're at a university, the English or communications departments may have courses in journalism or what's now called "creative nonfiction." You can also find classes online to hone your skills. Look for a journalism class where you can learn—and practice—basic newswriting. We recently had a recruiter come calling, looking for an editor to head up a major research society's journal. His difficulty, he said, was finding PhD scientists who had newswriting experience.
- Write every day, for yourself or on a blog. You'll become a better writer and discover, along the way, whether you enjoy writing enough to make a career of it.
- Get on Twitter. It's a great way to find the best science writing, to connect with other science writers, and eventually to promote your own published stories.
- Publish edited work. Edited work is going to be more polished and more appropriate to send out for job applications than blog posts. Start small—newsletters and blogs (such as the ASCB Post) are usually eager for more content.
- Network with other science writers at meetings organized for science communicators by NASW, AAAS, or ScienceOnline. NASW also has many local chapters like the DC Science Writers Association in Washington, DC, that meet several times a year.
- Look for a communications internship such as the AAAS Mass Media Fellowship. Be aware that these are highly competitive programs and generally require you to have "clips," published science writing (besides your science manuscripts).
- Go back to school. The fast track to writing for major news outlets is through science writing/communication master's programs like those at University of California–Santa Cruz, New York University, Johns Hopkins, or Boston University. However, master's degree programs with a vocational theme tend to be expensive and, unlike in the biosciences, fellowships are rare.

SCIENCE WRITING JOBS

We're both members (old school and new) of NASW, and we're struck by how many new and diverse science writing positions turn up on the NASW Job Board each week. People are hiring science writers. There used to be a stark (if sometimes ignored) division in NASW between "real" science writers, that is, science journalists working for traditional news media outlets, and science writers in public information or public relations. It is an increasingly meaningless distinction. Still, science journalism is a different calling. It is terribly competitive, and staff jobs are difficult to land. Most news organizations—online or on air— rely on freelance writers who are often poorly paid, but the insatiable appetite of the 24/7 news cycle also creates new opportunities for beginners and occasional contributors.

And yet, this new kind of science writing is creating opportunities for scientists who can use their bench training to interpret

research and their writing skills to make the lab world accessible. When staff science journalist positions do appear at a science news outlet like *Nature* or at a university research magazine, a writer with a relevant science PhD and a stack of well-written clips has a clear advantage. But science journalism is not the only show in town for science writing jobs. Many positions are in media relations—organizations looking for writers to take on the communications effort, writing press releases, interacting with journalists, building visibility (and buzz) on social media, and running websites. Government agencies, universities, and research institutes have staff writers with advanced science degrees to produce compelling material to promote their efforts. There is also a new zone emerging between journalism and public information, one in which scientist-writers and writer-scientists will find their own ways to tell stories without worrying about labels.

OLD SCHOOL AND NEW SCHOOL AGREE

Writing about science can be exciting and fun, if sometimes maddening. You go to the top places and interview the top people. You hear about great discoveries long before they become common knowledge. You explain the significance of things on a molecular scale to a world audience. In your daily quest for the novel and the newsworthy, you jump from field to field, subject to subject, and it never gets old. You get to ask idiot questions—the ones you would have been embarrassed to ask during seminars.

As a scientist fresh from the lab, you probably have skills that will help you in a science writing career. You already know how to identify great science, critically analyze papers, and ask good questions. You have an in-depth understanding of your field and know where to get help for something outside your field. You know how to work hard and meet deadlines. In whatever context you find yourself working, the basic task of a science writer is the same—translate "science" into vernacular language. That makes science writing no longer a skill reserved for professional journalists but part of the job description for all scientists.

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