How valuable is formal science training to science journalists?

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Abstract
The science writing community in the United States increasingly privileges formal science training as part of a science journalist's 'tool kit.' This article asks if existing research supports the argument that such formal training offers attributes *critical* to a science writer's work and finds that the answer is no. In studies of journalists generally, as well as a very small number of studies of science writers specifically, newsroom socialization and number of years on the job are more important predictors of journalists' levels of knowledge and their attitudes about professional behaviors than is the nature or extent of the their formal education. The article closes by posing a set of research questions that may permit a better understanding of the possible role of education in the work of science journalists.

Keywords: science training; science journalism; newsroom socialization

1. Introduction
As a university professor who trains students to communicate science to the public, I am always alert for internship opportunities, where students can obtain important, real-life experience as communicators. One such possibility loomed during a large science meeting, when I met a communications director from a federal science agency, who informed me that her office welcomed interns. However, she cautioned, the agency only accepts science writing interns who have earned science degrees. Others need not apply.

Implicit in that requirement is a judgment that one cannot be an effective public communicator of science without formal scientific training. That assumption, once rare in the United States, is becoming increasingly common and is beginning to influence not just the occasional opportunity to provide internship experiences to students but far more important elements as well, including decisions about who can participate in formal science writing training at the university level and hiring decisions at media organizations.

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Increasingly, science writers in the United States are scientists-turned-communicators. In this article, I want to explore this trend and to suggest that it may offer both advantages and disadvantages. One advantage of science-trained communicators is the prospect of increasingly sophisticated – and, presumably, accurate – discussions of science in the popular press. But any trend brings with it cautionary tales as well, and I will argue that the growth of science-trained popularizers may, among other long-term impacts, enhance efforts by the scientific culture to regain (some would argue that the better verb is 'to maintain') control over popular representations of science.

Finally I will reflect on the dearth of systematic evidence for or against the formal scientific training assumption and will suggest research questions that need to be answered before we can have a more complex discussion of the topic.

The movement toward scientists-turned-communicators in the United States is being nurtured by two trends. First, universities and other institutions that provide formal training for future science writers increasingly prefer science-trained individuals to those without such training. Second, scientists themselves are becoming more actively involved in popularization as the scientific culture encourages scientists in training to consider ancillary careers, science writing among them. I will first take a look at those two factors.

2. Science writing training in the United States

Although early practitioners of science journalism in the United States included a substantial subset of science-trained individuals, mass media science writers in the United States have historically been journalists first and science writers second. Science writers have always been present in small numbers in U.S. media, but their numbers burgeoned at two critical times: The first big influx of science writers occurred immediately following World War II, when the U.S. government, through the establishment of such funding agencies as the National Science Foundation, placed science on the national agenda and became its biggest financial backer. The second boom took place in the 1960s, when landing an astronaut on the moon became a national priority and presented the mass media with a major science news story for more than a decade.

In the decades before those two seminal moments, data about the backgrounds of science journalists are scarce. However, in 1939 a young graduate student at the Medill School of Journalism at Northwestern, Hillier Krieghbaum, set out to study the background of every single newspaper science writer he could find. His analysis of the 34 journalists determined not only that the reporters were, on average, more highly educated than most of their newspaper colleagues but that fully half of them had earned undergraduate or graduate degrees in science (broadly defined to include social sciences such as psychology) or engineering (Krieghbaum, 1940).

However, the aftermath of World War II and the space race sent the demographics of science writers in a different direction. To handle the major news stories that flowed from these events, media organizations promoted from within. It was common practice in the early 1960s, for example, for a journalist to be plucked from the general assignment desk and sent to Cape Canaveral or to NASA headquarters in Houston, where he (and it was overwhelmingly a 'he') would spend the next decade covering American efforts to put men on the moon.

A small number of surveys of science writers in the post-WWII years tracked this movement away from science training. For example, a survey conducted in 1957, 16 years after the Krieghbaum survey, found the same higher levels of education among these journalists compared to their non-journalistic peers but noted that 'the college background of most science writers was in liberal arts' (Johnson, 1957:248). A national survey of science writers conducted in the early 1970s found that the most common university specializations of these reporters were English and journalism. Other course content was predominately 'general' or 'introductory,' with algebra and geometry the only science-related subjects studied by more than 40% of the respondents (Ryan & Dunwoody, 1975).

Science writers in the middle of the 20th century, thus, brought a great deal of energy and journalistic savvy to their work, but little formal science training. That pattern seemed to continue into the 1980s and 1990s. For example, a survey of newspaper science writers conducted in the early 1990s reported that 73% of the 83 respondents had earned undergraduate degrees in journalism (McCleneghan, 1994). Although my focus in this article is on training in the United States, a study of British newspaper science writers in 1990, somewhat contemporaneous with the McCleneghan study, found that, of 30 reporters who provided demographic information, 12 (40%) had 'primary training in science' while the majority were trained in journalism or the liberal arts (Hansen, 1994: 113). A more recent study of Canadian newspaper science writers found, similarly, that 'the vast majority had no science training' (Saari *et al.*, 1998: 61).

The visibility of science as news in the mid-to-late 20th century, however, generated interest among university students in formal science writing instruction. Journalism has been a standard part of university curricula in many large American universities since the early 1900s, but few journalism faculty offered training in specialized writing. Today, courses and, with increasing frequency, entire programs in science, environment and health writing are available in many 50 universities around the country (Dunwoody & Harp, 1999).

The majority of those courses and programs are housed in journalism schools and are available, for the most part, to individuals who are accepted into those majors.

But an increasing number of science-writing programs today are offering training preferentially – and sometimes solely – to science-trained individuals. Among them is a highly rated graduate certificate program in science communication offered at the University of California-Santa Cruz, which requires applicants to have earned a bachelor's degree in science and to have had actual research experience before they can be admitted to training in science reporting. Notes the program's explanatory materials on its Web site: 'Full-time laboratory or field work gives program graduates an important edge over science writers who lack such experience. Most of the people accepted into the program have done graduate work in science, many to a Ph.D.' (http://scicom.ucsc.edu/write/Requirements.html).

Other programs welcome all applicants but privilege those with formal science training. The Science Writing component of The Writing Seminars at Johns Hopkins University, for instance, notes in its explanatory material on its Web site that 'successful applicants to the program in Writing about Science typically have undergraduate degrees in science, often master's degrees, and occasionally PhD's or MD's' (http://www.jhu.edu/~writsem/sciwrit/applicants.html). Similarly, New York University's Science & Environmental Reporting Program explains, on its Web site, that it does not require writing samples 'because most of our applicants have undergraduate science degrees, rather than journalism degrees' (http://journalism.nyu.edu/currentstudents/coursesofstudy/serp/index.html).

Another important adjunct to training – internship experiences – are also increasingly limited to students with formal science training. Illustrative here is one of the longest running and most visible science communication internship programs in the United States, the Mass Media Science and Engineering Fellows Program of the American Association for the Advancement of Science. Now in its 30th year, the AAAS program places science-writers-in-training for the summer months in major mass media outlets, among them *Popular Science* magazine, Dateline NBC, National Public Radio, the *San Francisco Chronicle* and the *Chicago Tribune*. But the internship program is available only to science-trained applicants. Notes AAAS in its application materials, 'Applicants must be enrolled as college or university students…in the natural, physical, health, engineering, computer or social sciences or mathematics in order to apply. Students enrolled in English, journalism, science journalism, or other non-technical fields are not eligible for these fellowships' (http://ehrweb.aaas.org/massmedia.htm). Since such internships can translate into full-time jobs, the selection bias has resulted in a rapid increase in the proportion of scientifically trained science journalists operating in the United States today.

3. The scientific culture's renewed interest in popularization

Another reason why formal science training has historically been rare among American science reporters is that the scientific culture in the United States for decades actively discouraged scientists-in-training from considering communication careers. In his book *How Superstition Won and Science Lost: Popularizing Science and Health in the United States* (1987), historian John Burnham explains that, although U.S. scientists in the 19th century were regularly involved in communicating science to the public, they virtually abandoned that activity early in the 20th Century.

In the mid- to late-19th century, writes Burnham, scientists viewed popularizing science as an important form of science education and as a part of their jobs. Eminent scientists routinely gave public lectures or wrote books for lay audiences. At one time in the late 1800s, he found, nearly all the officers of the prestigious American Association for the Advancement of Science had contributed at least one article to *Popular Science Monthly*, one of the more popular science magazines of the time.

But early in the 20th century, scientists in the United States abandoned popularization efforts. Specialization required increasing amounts of time, and the drive to professionalize – to accumulate social clout – led a burgeoning scientific culture to devote its energies to making distinctions between itself and the rest of society. In the process, popularization became a problem rather than part of a scientist's job description. Rather than encouraging scientists to make science accessible to the public, the scientific culture began punishing them for such activities. It did not take long for scientists to take the hint, and they left the field of science communication to the journalists.

Journalists since then have bemoaned the now-famous reluctance of the scientist to 'stoop' to popularization, while scientists have countered that journalists seem unwilling to cooperate in the interest of accurate coverage. The conundrum has spawned research on relationships between the two occupations (Boltanski & Maldidier, 1970; Dunwoody & Ryan, 1985; Dunwoody & Scott, 1982; Hartz & Chappell, 1997; Ryan, 1979), many sets of guidelines for 'normalizing' those interactions (see, for example, de Cordova et al., 1994; National Association of Science Writers, 1996), and a string of analytical books spanning almost 40 years (Friedman, Dunwoody & Rogers, 1989, 1999; Goodell, 1977; Goodfield, 1981; Kreighbaum, 1967; Nelkin, 1987).

But reluctant scientists may be on their way to becoming an endangered species in the United States. More and more frequently, scientists not only welcome contact with journalists but also even initiate it. More and more frequently, scientists are bypassing journalists entirely to address popular audiences directly, via print, broadcast, or World Wide Web.

One major reason for this change, I believe, is that scientists are coming to perceive value in public visibility. Among their newer – and accurate – assumptions:

• *The more visible you are, the more resources you get.* Scientists perceive a positive relationship between media coverage and their ability to obtain research funds (Dunwoody & Ryan, 1985). There is ample anecdotal evidence for this relationship; it is only a matter of time before systematic data validate it.

• *The public is a market ripe for exploitation.* Many scientists – thanks in part to university/industry collaborations that have become ubiquitous in the United States – are now heavily involved in the design of products that may have commercial value. One such scientist at a large research university in the United States, who usually rebuffed attempts to publicize his work, surprised his university public relations officer by readily granting an interview request, expressing hope that a story would run in a large-city newspaper whose community he had been trying to 'open up' as a market for his technological developments.

• *Media coverage confers social legitimacy.* Media attention may make some scientific work appear to be more important than other work. That the media may have such an effect is not surprising; what is surprising, however, is that media coverage seems to increase the legitimacy of a scientist's research not only in the eyes of the public but also in the eyes of other scientists. In a study of *New York Times* coverage of research published in the prestigious *New England Journal of Medicine*, scholars found that media attention apparently enhanced the importance of research in the eyes of other scientists working in the same specialty area. NEJM research articles covered by *The New York Times* were cited far more often in the publications of other scientists than were comparable NEJM articles not 'legitimized' by the newspaper (Phillips et. al., 1991).

Bolstering these perceptions of the benefits of visibility are a series of efforts by the scientific culture in the United States to reward scientists for popularization efforts. For example, large societies such as the American Institute of Physics and the American Association for the Advancement of Science now offer prestigious awards to scientists who have contributed to the public understanding of science.

One result of these new directions, I believe, is an increased interest among scientists-in-training in the prospects of a communications career. For example, the AAAS internships mentioned above were created initially to give media experience to graduate students in the sciences who, it was assumed, would complete their science degrees, become scientists themselves and use their understanding of the mass media to facilitate their own relationships with journalists. To everyone's surprise, it quickly became clear that a significant number of graduate student applicants wanted to *become* science writers. Today, AAAS expects approximately half of its applicants to express an interest in science writing careers.

4. The advantages of the scientist-communicator

An influx of writers formally trained in science should have obvious benefits. In this section, I will reflect on two: the usefulness of scientific knowledge to the accuracy and depth of science communication and the ability of formal science training to diminish problems of status differences between scientists and journalists.

• *More scientific knowledge should be better than less*. Journalists in the United States are routinely accused of covering science superficially, with distorting the image of science by over-emphasizing some developments and under-emphasizing others, and with routinely getting the facts wrong. Sometimes these accusations are well deserved, and it seems obvious that some scientific expertise would help minimize the problems that science writers face in coping with complex material. I offer two examples below:

At the simplest level, some science training should make a writer sensitive to scientific languages, even if they were ones with which she was not familiar. Such sensitivity could mitigate the kind of embarrassing mistakes as the following: Some years ago, a journalist covered an announcement about new funding for research on the use of tumor necrosis factor to combat cancer. A stranger to the vocabulary used by the scientists, the journalist wrote a story that heralded the start of a research project to explore the effects of tumor 'narcosis' factor.

At a more complex level, scientific training should provide journalists with the ability to evaluate evidence in ways that influence the interpretive framework of a story. For example, some years ago three former professional football players from the same California team were diagnosed with amyotrophic lateral sclerosis (ALS), a rare but fatal condition. In the search for an explanation for the puzzling disease cluster, individuals entertained the possibility that processed sewage sludge, used to fertilize the team's practice field, might be the culprit. Such sludge usually contains trace amounts of heavy metals, and some scientists speculate that ALS may be triggered by exposure to heavy metals.

Journalists who had little understanding of the scientific method, of probability theory, and of systematic ways of evaluating evidence quickly adopted the position that the sludge was not only a possible cause of the disease cluster but even a likely one. Their stories brought sales of the material to a halt and generated frantic efforts on the part of ALS sufferers to explore the possibility that they had been exposed to the sludge. Journalists with a better understanding of scientific ways of evaluating evidence, on the other hand, emphasized the lack of evidence linking the sludge to ALS and presented sources who argued strongly for chance as an explanation of the disease cluster (for a more detailed explanation of this incident, see Dunwoody, 1992).

• *The usefulness of status equality.* Public opinion pollsters regularly ask Americans about their relative level of respect for various occupations, and those polls demonstrate consistent status differences between science and journalism (see, for example, National Science Board, 2004:7/32-33) . The American public regards science as one of the most respected domains in the world, while journalists are typically relegated to a berth closer to politicians and used car salespeople.

These differences are longstanding. An early study of the relationships between physicians and journalists, for example, found that, while doctors saw much common ground between themselves and newspaper editors, they evaluated newspaper reporters on a series of semantic differential scales as less valuable, less strong, less intelligent and less cooperative than themselves (Carter, 1958).

When higher and lower status individuals interact, the former assume they will dominate the latter; thus, the scientists often make efforts to control the flow and ultimate disposition of journalistic information. In contrast, when a science reporter is in newsgathering mode, he/she assumes it is the journalist who will drive the interaction. One might argue that much of the tension in scientist-journalist relationships can be traced to collisions that result from these contradictory assumptions.

One way to mitigate this problem, of course, is for both individuals to have similar levels of status. Journalists with formal science training admit that they share their backgrounds with sources when it is politically useful to do so. Typical of this pattern is Dr. Julie Ann Miller, editor of the popular weekly magazine *Science News*, who indicates that her Ph.D. in neuroscience often comes in handy when she is talking to scientists. Convinced that she is 'more like them', they may be more comfortable sharing information than if they were talking to a non-scientist (Miller, 2004).

5. The disadvantages of the scientist-communicator

As is the case with all characteristics, the potential advantages of formal scientific training are probably tempered by debits. I suggest two:

• *Writers with formal science training may devalue other characteristics of good science communication.* Scholars in composition theory who study the process of writing argue that good writing requires three types of knowledge: an understanding of topic, an understanding of audience, and storytelling skills. Individuals formally trained in science may approach the task of writing well equipped with the first of that trio, but there is no guarantee that they will know enough about their audience or enough about good storytelling to be effective communicators. In fact, there is a risk that a science-trained individual will regard formal scientific knowledge as 'good enough' for communication purposes.

Illustrative of this phenomenon is the earnest, boring science column that used to be a staple of many American newspapers. A local scientist, determined to increase scientific literacy in his lifetime, volunteers to generate prose each week about such topics as fission, photosynthesis, and atherosclerosis. Blissfully unaware of his audience, he generates a weekly lecture that goes virtually unread.

Another common complaint about those trained in science is that inattention to audience leads them to assume far more knowledge among audience members than is appropriate. Research seems to support the argument that one's own expertise influences one's estimates of what other people know (see, for example, Nickerson et al., 1987).

The privileging of knowledge over other dimensions of the communication process is evident in scientific training itself, which allows little time for the development of communication skills despite the fact that scientists' need to publish their work in the peer-reviewed literature means that individuals in this occupation, for all practical purposes, write for a living. The dearth of formal communication training in Ph.D. or M.D. programs conveys a clear signal to scientists-in-training that one can easily pick up communication skills 'on the fly.'

• *Scientists-turned-communicators may be better advocates than critics of science.* Historically, the mass media in the United States have articulated an obligation to remain distanced from society in order to serve as its cultural watchdogs. That 'watchdog' role is implicit in the U.S. Constitution, which mandates freedom of speech and of the press. The role is often violated in practice, as some researchers have shown (see, for example, Olien et. al., 1995), but the ideal continues to be strongly embraced. Partly in response to this ideal, journalism training in the United States has evolved within universities but in units separate from those that provide content expertise, such as political science and biology. To the extent that such independence is philosophical rather than territorial, it seeks to demarcate the boundary between the journalist and her sources, to provide the journalist with the kind of ideological independence needed to be critical.

But independence is precisely what science – as well as most other fields subjected to journalistic scrutiny – do not want reporters to have. The scientific culture works to maintain control over its public representations through a variety of mechanisms, including journal article embargoes (Kiernan, 1997) and a focus on accuracy (Dunwoody, 1999). When control is impractical, science will sometimes react by denigrating those products beyond its reach.

Hilgartner (1990), for example, argues that the scientific culture attempts to create a chasm between scientific knowledge and public representations of that knowledge by insisting that 'popularization' is a low-status, overly simplified form of scientific communication that deserves little respect. The distinction provides a powerful tool, says Hilgartner, for sustaining the hierarchy of expertise in our culture that routinely places science at the top.

Similarly, Green (1985) argues that science defines popularization efforts as something 'done' to science, as a form of information pollution. Again, the goal is to allow the scientific culture to deny the validity of those scientific messages over which it has little control. If information is not provided by scientists, in essence, it is not 'good' scientific information.

Viewed from this perspective, the influx of scientists-turned-communicators in the United States has a distinct ideological edge: the more scientists involved in popularization, the greater the level of control the scientific culture may exercise over public representations of science.

Nelkin, in her popular book *Selling Science*, worried that scientists already control these representations so thoroughly that science coverage in the United States is largely non-critical (Nelkin, 1995). Her charge is echoed by American investigative reporter John Crewdson, who refers to science writers as 'perky cheerleaders' who not only are passionate about science themselves but also 'want their readers to like it too, or at least to understand how important science is' (Crewdson, 1993:12). Crewdson argues that journalists who are captured by the wonder of science may not do the hard critical work to keep science honest or be willing to rummage among the complexities of science's relationships to industry, finance, and politics.

6. Where's the evidence?

How does one sort out this contested terrain? Do science-trained science writers behave differently than those journalists with other types of backgrounds? Are they somehow better? Worse? Is there a defensible reason to systematically privilege those with science degrees in training programs or in hiring processes?

Few scholars have turned their attention to questions of the effects of education type or level on performance of journalists generally, and even fewer have looked for performance differences in science writers. In the former literature, some effect of formal education can be found, but it is often mediated – and sometimes trumped soundly – by informal education processes at play in the newsroom.

In a seminal study in the 1950s, sociologist Warren Breed interviewed journalists and editors employed by newspapers in the Northeast and found newsroom socialization to play a powerful role in establishing normative behaviors for journalists.

The pressure on a journalist to conform to the work standards of a particular newsroom and to meet the demands of the subset of editors who presided there virtually overwhelmed individual background factors, Breed argued. In other words, one could account for most of the variance in reporter performance by understanding the norms of that reporter's particular newsroom (Breed, 1955).

That finding has proved to be robust. Although few scholars have studied the newsroom itself since Breed, others have operationalized a close cousin, the experiential impact of number of years on the job. That variable has proven to be similarly powerful. For example, in one attempt to uncover predictors of newspaper performance (operationalized via expert judgments about such issues as the thoroughness and balance of a newspaper's stories, as well as its quality of writing and editing), Becker et. al. (1978) found that a combined measure of the level of education and amount of journalistic experience of newspaper reporters was by far the best predictor.

In a later study, Becker et. al. (1987) examined the influence of formal journalism training on U. S. students, surveying new graduates and then evaluating attitudes and beliefs of graduates one year later. Again, they found a mixture of formal education and experiential factors at work. While a year on the job seemed to have had little effect on the communicators' professional or ethical values – presumably instilled during their university years – the year did contribute to a decline in feelings of pride in and commitment to the occupation. Noted the researchers, 'The evidence is that the actual work setting, rather than training experience, has greater influence on that change' (Becker et al., 1987:157).

An ongoing decadal survey of American journalists further demonstrates the importance of both education and experience but seems to track, over time, a declining contribution of education (Weaver & Wilhoit, 1996). For example, while 1971 data showed education to be a powerful predictor of journalists' perceptions of their roles (i.e., preferences for interpreter, disseminator or adversarial roles), by 1992 formal education made, at best, a modest contribution to role perception. And while journalists in the most recent national survey did mention 'teachers' as ethical influences, the most frequently cited influence was the newsroom. Noted the authors: 'Of the various factors that shaped the professional values of journalists in 1992, the newsroom environment was the most important' (Weaver & Wilhoit, 1996:171).

In the world of science writing, then, does formal science education matter? One certainly would anticipate little impact of such education on a reporter's normative journalistic behavior. But it seems logical to expect that formal science training should play a role in such variables as level of science knowledge.

We await substantive tests of that hypothesis, but I will summarize below the results of two studies that provide at least a preliminary answer.

Science communication scholar Kris Wilson posed more than 70 questions about global climate change to members of the Society of Environmental Journalism, a group that accepts into 'active' membership only individuals who produce stories for mass media outlets that serve the public (Wilson, 2000). He then explored predictors of knowledge levels, among them whether the respondent had majored in an 'environmental science' and the percent of time the respondent devoted to covering environmental issues.

Wilson found that, indeed, formal science training did account for a statistically significant amount of variance in knowledge levels. But it was not the strongest predictor. That honor went to the percentage of time the reporter devoted to environmental coverage. Put another way, on-the-job experience was the primary contributor to knowledge, a pattern consonant with the more general analyses of predictors of journalistic performance above.

In a second study, Wilson (2002) posed the same bevy of global warming questions to a sample of U.S. television weathercasters, often the journalists with primary responsibility for science reporting at television stations. Formal training fared even more poorly in this study, failing to account for significant variation in knowledge. Occupational variables such as the size of the market in which the station was located also failed to explain variation in knowledge.

7. In conclusion

Education clearly matters when it comes to journalistic performance, but the role of that individual-level component remains difficult to see clearly. U.S. scholars over the years have tracked a complex interplay between a journalist's formal education and the informal education that comes with on-the-job training. In most cases, the variable that has the most profound effect on the dependent variable of choice – whether knowledge or perceptions of professional role – is the latter rather than the former. When an individual enters a newsroom and its accompanying occupation, powerful forces will work to shape her notion of what constitutes 'good work,' and accumulating years on the job will give her an increasingly complex topic knowledge base. The evidence presented above suggests that those forces eventually will swamp earlier factors, including formal education.

This evidence, while not antagonistic to arguments on behalf of the inclusion of formal science training as a component of a science writer's suite of competencies, does call into question efforts to limit participation in the occupation to those with formal training in science. Put another way, the data reported here support such training's usefulness but do not support arguments that it is essential.

Of course, one might correctly counter that the evidence is sparse. This important debate about training future generations of science communicators could benefit from systematic answers to a variety of questions. I will pose three:

- Might formal science training be more helpful to a journalist earlier in her career rather than later? The experiential effects found in the studies above are accumulative and probably become significant predictors only among experienced journalists. If characteristics instilled prior to entering the journalistic workforce are influential, one may be more likely to find them at work at entry-level. A study that allows time in the occupation to vary may unearth such an effect.
- Might formal science training influence some types of knowledge but not others? Scholars reflect on a variety of knowledge dimensions, and it is possible that

distinguishing among those dimensions would produce differential effects. For example, Jonassen et al. (1993) distinguish between 'declarative knowledge' and 'procedural knowledge.' The former represents an awareness of an object or process but does not imply more than a superficial understanding, while the latter typifies a deeper and more complex mental representation. Is it possible that formal science training could serve as a catalyst for the latter while experiential learning on the job assists with the former? Seeking reporter levels of different types of knowledge about a science topic may be one way to find out.

• Might formal science training influence the perceived role of a science journalist? Those with formal training, for example, may seek to invest more heavily in explaining science to the public (the 'interpreter' role) than would someone trained centrally in journalism. The literature cited above suggests that experiential factors will make the larger contribution to perceived role, but it may be possible to illuminate secondary factors, formal education among them.

Although science communication scholarship has become a thriving area of inquiry around the world, the scant research summarized in this paper suggests that few scholars have tackled questions of how best to prepare individuals to communicate science to the public. Given the obvious utility of the answers, it is time for scholars to take on those questions.

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