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Knowledge-based Journalism in Science and Environmental Reporting: Opportunities and Obstacles

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ABSTRACT
Recent calls for knowledge-based journalism advocate a new level of formal knowledge in news reporting to meet the professional challenges caused by rapid change in the news industry. Scientifically knowledgeable journalism has the potential to redefine the existing science–media relationship. However, the audience for such journalism is unclear, nor is it known how this new journalism would function within rapidly changing newsroom practices. Implementing knowledge-based journalism requires theory-based propositions to show the actual benefits of improved scientific understanding for news consumers and an understanding, from research into professional cultures, of why new practices in journalism are adopted or abandoned. This paper develops that theoretical basis by examining knowledge-based journalism’s potential and some of the intellectual and institutional barriers to it.

Science journalism and environmental journalism are among the many journalistic practices subject to the forces changing the entire media landscape in the twenty-first century, blurring the lines between journalism and other forms of information production. In a member poll by the National Association of Science Writers, a substantial portion of respondents identified not in recognizable journalistic roles but as bloggers, consultants, educators, scientists, feature or non-news writers and the more general category of outreach (Bajak, 2016). One commentator called this broadening of membership (and the implicit loss of a cohesive social role for science writers) “Science Journalism’s Identity Crisis” (Lunau, 2016). Gibson, Craig, Harper, and Alpert (2016) and Fahy and Nisbet (2011) found science and environmental journalists working under increased pressures, with negative effects on reporting and the news product. These are part of the ongoing structural and technological changes to journalism’s more settled routines and assumptions, including the daily news cycle, the professional monopoly over news reporting, the separation of reporting and opinion, and stable patterns of news production and consumption. Curran (2010), who sees opportunity in this as well as crisis, calls these old patterns the industrial model of journalism. Many changes have been proposed to meet this crisis, including greater use of nonprofessional “citizen journalists” and less reliance on official sources to establish newsworthiness.

Other scholars attempt to address these changes by imagining a new role for the profession. Donsbach (2014) calls journalism “the ‘knowledge profession’ of our times” (p. 6) and called for all journalists to acquire greater systematic and formal knowledge of their topics in order to reverse the declining credibility that lessens journalism’s influence over peoples’ thoughts and views. Patterson (2013), likewise, concludes that the solution to this crisis lies in a “science of journalism” (p. 77)
that has “knowledge at its core,” based on systematic inquiry and leading to more valid explanations of events (p. 74).

Speaking of both science and environmental journalism, Nisbet and Fahy (2015) argue that knowledge-based journalism can help correct the distortions and exaggerations of bloggers and advocates. They see the problems of science and environmental journalism as part of a broader crisis encompassing not only fragmentation but the rejection of traditional journalistic objectivity. Evidence of this shift appears in declining attention to “legacy” newspapers and newscasts and increasing reliance on social media and entertainment that mimic the rhetoric of journalism—so-called fake news (Marchi, 2012). To Donsbach (2014) these changes weaken society’s common bond of knowledge and community. Like citizen journalism (Barnhurst, 2013; Peters & Broersma, 2013; Porlezza & Russ-Mohl, 2012; Witschge, 2013), knowledge-based journalism has the potential to transform journalistic practice and journalists’ relationship with the audience. It will likely call for journalists to learn new attitudes, norms, routines, and work habits (Witschge, 2013). Old and new practices may need to be integrated in ways that have few precedents.

Perhaps because proposals for knowledge-based journalism still exist as concepts and advocacy rather than actual widespread practice, they have sometimes been criticized as naïve and unworkable (Claussen, 2015; Davis, 2014; Dimitrova, 2017; Stempel, 2014). This paper examines the ideas behind knowledge-based journalism and the criticism in greater detail to discover how it might function in actual reporting situations, which might clarify both its unlocked potential and some of the barriers to its implementing it. This in itself could be an important step toward overcoming those barriers.

When Fahy and Nisbet (2017) built their case for knowledge-based journalism, they examined journalists (i.e. Andy Revkin or Oliver Morton) who functioned as ecological modernizers, explaining a range of frequently uncertain knowledge claims and brokering between different policy options. While these journalists often grew into their roles through a unique set of circumstances, we extend Fahy and Nisbet’s work beyond these paradigmatic examples by searching for underlying principles that might allow journalists to be systematically trained in knowledge-based journalism. We consider the obstacles that prevent it from growing and becoming institutionalized in the media and in journalism schools. In addition, we examine the challenges and opportunities for knowledge-based journalism from the perspectives of audiences, media organizations, and journalism education. Because the discussions about knowledge-based journalism have been framed in the context of the U.S. and to a lesser extent Europe, we mainly refer to the application of knowledge-based journalism in the context of the U.S. media.

In this study, we chose to focus on science journalism and environmental journalism together. The widespread use of scientific findings and data in environmental reporting means science journalists who cover such topics as controversial technology or technological disasters and environmental journalists who cover ecological problems face closely related professional challenges. Nisbet and Fahy (2015) recognized the considerable overlap between the two areas of reporting because of the constant presence of science at all levels of environmental issues. This has also been studied by other researchers (Bødker & Neverla, 2012; Hansen, 1991; Taylor & Nathan, 2002). Both beats must deal with the difficulties of translating arcane, complex, and specialized knowledge to multiple audiences. Despite the fact that they are often only tentative, these emerging findings may still be used as input for high-stakes political choice involving issues of risk evaluation or perception, with conflicting claims and uncertain outcomes. The policy agendas can stimulate as much interest as the immediate news development, requiring journalists to communicate scientific evaluation of risk while remaining sensitive to multiple non-scientific risk constituencies such as policy-makers and the public. Bødker and Neverla (2012) say environmental journalism deals with controversies that lie at the intersection of the scientific and the normative, in which advocacy or interest groups use scientific knowledge or data to lend legitimacy to their claims. The public agenda may not align precisely with an objective assessment of environmental problems (Hansen, 1991) nor is there necessarily a one to one relationship between problems, their articulation, and the needs of society. In these circumstances, where the relationship between science and policy problems is rarely
straightforward, both science and environmental journalists need a knowledge base to explain opposing findings, separate the legitimate claims of science from the power of scientific authority (Taylor & Nathan, 2002), and avoid the problem of false balance (Boykoff & Boykoff, 2004).

Conceptual assumptions of knowledge-based journalism

Patterson’s book Informing the News (2013) first reported on the efforts by some American universities to give journalists substantial levels of technical expertise about the subjects they cover. Doing this would require journalists to function less like generalists and more like medical doctors or other highly trained professionals, preserving journalistic standards while also distinguishing their news product from the proliferation of non-professionalized information. He called this journalistic approach knowledge-based journalism.

Continuing Patterson’s line of thinking, Donsbach (2014) argued that journalists must do more than simply transmit stories, merely to keep society from flying apart due to the centrifugal force of so much internet-based information and the accompanying decline of trust in media as public institutions (Barnhurst, 2013). He called for journalists to develop five competencies:

- Knowledge of history and the intellectual context in which news occurs that would allow journalists to triangulate and understand contemporary events and issues.
- A deep enough education in the subjects they cover to let them identify experts, ask critical questions, and sort the answers for relevance to their audience.
- Process competence: understanding how ideas and information propagate through societies and how audiences are affected by new information, giving journalists some self-awareness about the effects of their choices.
- The technical skills, editorial judgment, and flexibility to convey a message across multiple platforms.
- An understanding of professional roles and responsibilities and where their professional loyalties should lie.

Similarly, Nisbet and Fahy (2015) fear that the proliferation of blogs and special interest websites makes it difficult for the public to find information except in the context of some kind of advocacy. Their own interviews with science journalists show that the broadened, fragmented science-media system of today contains not just journalists but public intellectuals, civic educators, curators and advocates, all roles not historically considered a part of journalism. They suggest knowledge-based journalism would allow its practitioners to “contextualize and critically evaluate expert knowledge, facilitate discussion that bridges entrenched ideological division, and promote consideration of a broader menu of policy options and technologies” (Nisbet & Fahy, 2015, p. 223). Donsbach (2014), meanwhile, fears that the decline of interest in public affairs among younger audiences and the increasing fragmentation toward specialized media will lead to a decline in traditional professional journalism. He argues that traditional journalism provides the civic glue that makes public life possible.

None of these authors offered detailed arguments about the components of knowledge-based journalism, how to create it, teach it, make it function in daily news practice, or measure its effectiveness. It is no surprise, then, that since it was first discussed, knowledge-based journalism has attracted criticism. Claussen (2015) accused Patterson’s Informing the News of over-optimism about the willingness of schools to teach knowledge-based journalism or of news executives to adopt it. Davis (2014) criticized it for failing to offer a detailed alternative curriculum. Stempel (2014) criticized Patterson for starting with “an inaccurate and incomplete notion of what journalism education is (p. 409).” Dimitrova (2017) questioned whether knowledge-based journalism would make a significant difference in the eyes of financially strapped publishers. Claussen believed existing journalistic institutions would find knowledge-based journalism a poor fit with their values, regard it with extreme suspicion or hostility, and likely reject it.
When Donsbach (2014) called for journalists to develop subject competence and communication process competence, he never specified how this should work in daily practice. Subject competence might require an environmental journalist to have extensive knowledge of scientific theory and methods. But this still fails to address the question of which sciences to know and how much knowledge is required. Should this knowledge be at the bachelor’s level, the master’s, or the PhD? Are theory and methodology both required? Would journalists need enough process competence to understand the intellectual and practical challenges scientists face when conducting research? Since many environmental journalists also cover the effects of science on policy, would subject or process competence also include a theoretical understanding of how environmental policy is created and reshaped?

A number of researchers (e.g. Bell, 1994; Dunwoody, 2012; Mcinerney, Bird, & Nucci, 2004; Vestergård, 2011; Wilson, 2000, 2002) have tried to answer some of these questions individually. None found that journalists with advanced degrees or science degrees produced higher-quality environmental or science reporting. For several, the best predictor of reporting quality or accuracy was time on the job or in their current newsroom. Similarly, examining Colorado newsrooms, Crow and Stevens (2012) expected the loss of specialized reporting talent caused by layoffs and budget cuts to result in the lowered quality of science and environmental coverage. Instead, they found journalists covering science and environmental stories did not have significantly different education or training from their non-science colleagues, nor was their coverage significantly different as measured by use of primary sources. This is despite findings by Schneider (2010), Kolandai-Matchett (2009), and Valenti and Tavana (2005) that focused workshops and training sessions can have limited but measurable impacts on science and environmental journalists’ knowledge of specific techniques, terms, and concepts. Collectively, these findings challenge, or at least complicate the idea that scientific knowledge would be useful to journalism in any straightforward way.

There appears to be little or no theoretical, evidence-based research about how journalists of any kind, much less specialists such as science or environmental journalists, acquire and use subject knowledge (as opposed to knowledge of the journalistic craft). Among the limited individual studies, Wilson (2000) found that full-time science reporters had a more accurate knowledge of climate change than a general population of reporters and the lay audience. Attfield and Dowell (2003) examined the information gathering process of newspaper reporters from the standpoint of individual activities and organizational constraints. A separate body of research by educational psychologists (Eraut, 2007; Kronstad & Eide, 2015; Kyndt, Dochy, & Nijs, 2009) has studied the circumstances and processes by which professionals (such as journalists) acquire knowledge on the job. These include feedback, coaching, reflection, confidence, means of accessing knowledge and information, range of internal and external contacts and networks, complex work demands, and proper mentoring (Kyndt et al., 2009). The ability to locate people with the right knowledge is important as is the ability to ask the right questions, willingness to try new things, and use of mediating processes. Eraut (2007), quotes a trainee accountant: “Every time you go into a new job it doesn’t look quite as strange as it did the job before … you get more understanding and that … leads to a bit more confidence in what you’re doing and questions you’re asking” (p. 412). These insights have a direct application to knowledge acquisition in journalism. However, except for Kronstad and Eide (2015) who studied non-formal learning in an online newsroom, no researcher seems to have connected the general principles of the educational psychologists with what researchers such as Wilson (2000) and Attfield and Dowell (2003) have learned specifically about journalists.

**Challenges for implementation of knowledge-based journalism in news organizations**

While Patterson recognized that knowledge-based journalism “would face resistance” (p. 101), he never inquired how or why. A key source of that resistance might be the deeply embedded professional norms of journalistic practice and of journalism as an institution, which powerfully
shape the ways science and environmental journalism are done (Chadha, 2016; Hinnant, Jenkins, & Subramanian, 2016; Miller, 2011; Tong, 2015).

This is consistent with what has been found about other professions. Changes in the way they operate have rarely been the product of good intentions alone, suggesting they may offer a model for studying similar reform efforts in journalism. Sociologists of the professions (e.g. law, medicine, and clergy) say shifts in professional roles happen (or fail to happen) for complex reasons such as a profession’s internal dynamics or increases in tensions in its relationship with those it serves. Brint (2014) says modern ideas of the professions began in the nineteenth century, beginning with law, medicine, and clergy. The information asymmetry between these “original” professions and those they served, and the fact that they dealt with high-stakes, even life-or-death matters of great sensitivity, necessitated relationships based on trust rather than money alone. The result was a social sector with aspects carved out from the normal expectations of the market economy, expressing higher social purpose, self-governance, and self-direction. Brint calls this “social trustee professionalism.”

Over time, however, other professions such as teaching, engineering, and social work and journalism sought this role for themselves (along with the high status of its members), with mixed results. Today’s professions rarely have the priest-like independent authority of old. Englund and Solbrekke (2010) say contemporary professionals are under pressure to balance older ideals of professional responsibility with newer ideas of accountability such as efficiency, cost effectiveness, and evidence-based standards. However, the way professionals (including journalists) deal with these conflicting pressures (particularly within large organizations) is not well understood. Mindich (2000), studying journalism as a social practice and the circumstances that gave rise to it, documented how the journalistic concept of objectivity, often seen as almost a moral imperative, only came to be a controlling ethic in this manner after it was already widely accepted in most newsrooms. This seeming paradox raises questions about how the demands of accountability, flexibility, competitiveness, and efficiency actually work to reinforce or challenge the demands of professional responsibility. Do they come from inside the profession, outside it or from above? Are the meanings or connotations of terms like “accountability” and “responsibility” changing under the logic of current demands? Questions like these are relevant to any journalist trying to meet high standards under pressure of decreasing budgets, uncertain objectives, and increasing demands for efficiency and productivity.

The complex origins of professional norms and practices are strong evidence that they would be as difficult to change in journalism as anywhere else. Hinnant et al. (2016) found the role definition of health journalists changed when work circumstances changed. Secko, Amend, and Friday (2013) found journalists acted to pass information from actively involved scientists to a passive public. The nonstandard models of science journalism tested in focus groups by Amend, Capurro, and Secko (2014), actually stimulated more audience engagement. However, these non-traditional models do not follow the norms of daily newsroom practice, and there is only limited knowledge of how audiences respond to them outside of an experimental context. Gibson et al. (2016) as well as Giannoulis, Botetzagias, and Skanavis (2010) found that, in present practice, different environmental journalists played different professional roles. Some saw themselves solely as disseminators of facts; others considered themselves interpreters and investigators, while others tried to mobilize people to take action for or against an environmental cause. None had advanced degrees in environmental sciences. Most did not think their reporting would improve if they thought more like scientists. None questioned the overall structure or functioning of mass media, raising again the issue of how a newer kind of knowledge-based journalism would function within existing media organizations.

Similarly, Tandoc and Takahashi (2013) found the tension between responsibility to audiences and accountability to managers outlined in other professions by Englund and Solbrekke (2010) existed among environmental journalists trying to balance the roles and demands of work with the expectations of news organizations and the public. The roles they actually played were not always identical to those they imagined for themselves. Reporters acted as interpreters of news as well as adversaries and mobilizers more than their organizations did but rarely adopted the role of advocate.
This range of routines encompasses only traditional journalism. Studying online journalists, Cassidy (2005) found that both the conventionalized approaches of news work and shared norms of professional behavior shaped professional roles. Policies were rarely spelled out but rather enforced indirectly and subtly, learned through on-the-job socialization and reference group behavior. Some spaces in new media allow roles for commentators who may or may not have traditional newsroom backgrounds, skills, or socialization (Fahy & Nisbet, 2011). These include curating skills such as culling, shifting through and ordering the vast amount of existing science information, educating, such as using background information to inform audiences of the whole scope of a science and public intellectual, filtering new scientific developments through a coherent worldview.

Behind this wide variety of practices lie a range, not only of rules, but of functions and purposes, not all of which may fit comfortably into the purposes of knowledge-based journalism. And the persistence of older newsroom patterns as well as the role conflicts described above both challenge the idea that knowledge-based journalism will be easy to implement. Future research would need to examine how newsroom socialization influences science and environmental writers’ understanding of acceptable norms for their reporting. Understanding how those norms arise and what keeps them in place is an essential first step toward modifying them.

The obstacles to implementing knowledge-based journalism in journalism education

Donsbach’s goal of populating journalism with scientifically knowledgeable journalists will involve more than simply hiring applicants with advanced degrees. The call for knowledge-based journalism, aspiring as it does, to transform journalists’ daily thought and practice, also implies a role for journalism education. At present, however, journalism schools lack a clearly defined body of knowledge students are expected to learn and emphasize skills over subject knowledge (King, 2008). It is unclear whether these schools are prepared to teach a body of knowledge comparable to what Donsbach and others believe is necessary. Some of this (such as knowledge of scientific principles, sociology of science, or science policy) might have to be acquired in other departments. This new knowledge would need to be combined with journalistic skills, raising substantive and pedagogical questions of how the two could be integrated in order to teach knowledge-based journalism in a structured way.

A concrete example of how difficult it can be to adopt knowledge-based journalism is how journalism schools teach statistics. Dunwoody and Griffin (2013) found that program heads recognized that faculty are not always equipped to teach statistics and students not always interested in learning. Though they were sometimes willing to offer greater rewards to faculty who incorporated quantitative literacy into their courses, neither the constraints (student and faculty apathy) nor the incentives (the rewards) appeared to change the level of statistical instruction given in journalism programs over the course of eleven years.

This raises a question: why would a form of journalistic knowledge valued by all participants have such difficulty gaining traction in journalism schools? The findings suggest not simply a failure of individual leadership, but that structural obstacles also stand in the way. But the problem goes beyond the schools. Griffin and Dunwoody (2016) cite a Poynter Institute survey (Finberg & Klinger, 2014) showing 73% of journalism educators rated data sophistication a valuable skill while only 55% of working journalists felt the same. What circumstances keep a valuable skill such as statistical reasoning unpopular among both journalists and educators and what does this imply for imparting a broader knowledge base? The problem has sometimes been identified as lack of numeracy, an imprecisely defined term that appears to mean the ability to use, or degree of comfort with, numerical concepts and operations. However, individual researchers (Curtin & Maier, 2001; Harrison, 2016; Nguyen & Lugo-Ocando, 2015) have tended to use the concept in different ways and it remains poorly conceptualized and understood. More broadly, the difficulty of implementing better statistical education is an example of the larger problem of trying to understand why a professional practice or
value fails to be implemented despite widespread support by educators and at least some practitioners. A clue to this problem can be found in Schudson (2001) and others (Mindich, 2000; Nerone, 2000) who studied the rise of objective journalism in the nineteenth century. While this is usually explained as a commercial response to new technologies such as the telegraph, these scholars found that the rise of objective journalism was never a single thing but grew out of separate but related developments: non-partisanship, political independence, balance, the inverted pyramid storytelling style, the naïve empiricism of “just the facts.” These grew out of separate historical circumstances more varied than technology alone and may also have included simply the force of the idea of objectivity itself on a receptive profession and on audiences. Schudson’s larger point can be applied to knowledge-based journalism: that lasting changes in journalistic practice rarely have a single cause. In order for reform to take place, it is necessary to examine all the reasons why practices (such as journalistic objectivity) come to be seen as prescriptive or moral norms and not merely “the way we do things” as well as the reasons why other practices fail to be adopted.

Some evidence suggests that student values in journalism school do not change significantly between beginning and advanced academic levels (Carpenter, Hoag, Grant, & Bowe, 2015), raising the issue of exactly how much socialization is taking place and what is preventing more of it. If journalism students are not being transformed by their schooling, it is imperative to ask why, what attitudes are currently being transmitted (along with instruction in skills) and how these could be changed or strengthened in order to set students on the course knowledge-based journalism demands. There are some examples of innovative apprenticeship-style environmental journalism education that includes a balance of textbook and classroom instruction and intense immersion in the practical problems of actual coverage of day-to-day environmental news (Freedman & Poulson, 2015). Such a program might serve as a site to investigate what journalists learn about numbers-based news developments in the classroom and what they learn separately on the job (such as wildlife population statistics in ecology) and how the theoretical and practical forms of knowledge complement or modify one another. This might spur the development of a theory that could help illuminate the broader difficulties of establishing other kinds of expert knowledge both in journalism education and in practice.

**Practical problems: reporting quality and new media technologies**

**Defining and measuring journalistic quality**

Knowledge-based journalism’s aspirations to improve reporting quality cannot be separated from the question of what that quality consists of in the first place and how to measure it. A number of measurement schemes have been proposed over the years, but these have been based on different concepts of how journalistic quality should be defined as well as the metrics to gauge it. Lacy and Rosenstiel (2015) distinguished between measures of journalism quality set by professionals and those driven by audience preferences. Likewise, Rögener and Wormer (2017) discovered a set of internal standards widely held by environmental journalists to evaluate the quality of each others’ work, but not all of them were closely followed in practice. Gibson et al. (2016) found that traditional values of accuracy, neutrality, and independence may actually facilitate better science and environmental journalism even in the disrupted environment in which much-specialized journalism now functions. They believe knowledge-based journalism can form a support system for this.

The methods used by these researchers might be modified to measure knowledge-based journalism. However, this would first require understanding the kinds of distinctions necessary to detect or analyze Donsbach’s concepts of knowledge of history and the intellectual context in which news events occur or the social-psychological factors governing news decisions.

Together, these issues only address what might be called internal measures of quality without considering what the audience thinks. Lacy and Rosenstiel (2015) say the process of evaluating all
journalism, science-based or not, is subject to social influences that remain poorly understood. Some research (Artz & Wormer, 2011) suggests audience needs are not always well connected with journalists’ definition of what has news value. Audiences may use news for surveillance of their environment, decision-making information about the political, social and economic world, and cultural interaction and entertainment. Users of environmental journalism in particular may read stories with different needs or purposes than they would with other topics. Existing empirical studies of what audiences want from environmental journalism are limited and do not always display strong or consistent theoretically driven patterns. In science, Secko et al.’s (2013) four theoretical models of science journalism included (1) the deficit model aimed at translating scientific information into terms people can use, (2) the contextual model shaping presentation of science to different audiences and needs, (3) the lay expertise model interpreting science in light of non-scientific knowledge systems, and (4) the public participation model encouraging involvement and debate by stakeholder groups. These last three all seek greater audience involvement. However, other investigators like Corbett and Durfee (2004) and Amend et al. (2014) found human drama and the audience’s personal interest played a larger role in holding the attention of users than the scientific achievement itself. Left to their own devices, audiences did not care about scientific uncertainties as precisely as scientists (Maier et al., 2016) or were outright indifferent. Some showed discomfort with ambiguous scientific findings but others did not. Their major interest was not in degrees of uncertainty but in how science could be used in their lives. Alternatively, people who classed themselves as frequent readers of science stories distrusted stories that simply aimed to convey information and also demanded context and critical thinking.

Responses such as these suggest that audiences are prepared to respond to other kinds of science journalism than they receive at present. However, the theoretical models are not linked to audience demand in ways that could locate or measure them.

The problem of knowledge-based journalism in new media

New media, with their multiplicity of affordances, add another set of possibilities to knowledge-based journalism but also add another dimension to the quality issue. Users can watch the news on large screens or handheld devices. They can read the print on paper or on a screen, interact with it through comments or blogs, pass its content on to new users through social media, or combine several pieces of content from different media into a single message. While this complicates (if it doesn’t challenge entirely) the traditional authority of journalists over the environmental or science narrative, it also creates openings for new kinds of journalism that could mediate between forms of expert knowledge, policy-makers, and non-specialist audiences (Fahy & Nisbet, 2017). As Loosen and Schmidt (2012) have observed, these new uses make it possible for users and creators to pass information back and forth more frequently, in ways seldom possible in older media. New media, that is, substantially alter the traditional one-way relationship with audiences (Meehan, 2007). Under such circumstances, more engaged and interpretive users such as Amend et al.’s (2014) frequent and critical science readers might respond to new kinds of environmental and science journalism in new ways. Some might be informed enough to take part in scientific and policy controversies, matching wits with the experts and taking debates in new directions (and in the process, giving new strength to Secko et al.’s (2013) public participation model of science journalism). Given these possibilities, understanding how the users of new media think and what kinds of science news they want could be a first step toward creating more demand for it. A full methodology for measuring knowledge-based journalism could not be developed without taking these complexities into account, many of which are still actively under study. Bermejo (2009) says the contemporary audience ratings industry is in crisis partly because of the challenge of tracking so many different smaller audiences and their different uses. New forms of audience measurement would also have to address both questions of which aspects of new media uses are worth measuring and how to operationalize them. Nevertheless, the argument supporting higher-quality journalism as a result of knowledge-based
journalism practices goes beyond a purely normative and idealistic stand. Some past research on traditional media has already highlighted the positive correlation between revenue over time and higher-quality news content (Kim & Meyer, 2005; Li & Thorson, 2015).

**A proposed alternative: interactional knowledge**

The obstacles to knowledge-based journalism described above still do not indicate that it has no value or could not be implemented in some way. Some of the same researchers who uncovered these difficulties, such as Dunwoody (2012), Kolandai-Matchett (2009), and Valenti and Tavana (2005) believe more formal science training would benefit science writers. Such benefits, according to Fahy and Nisbet (2017), could include the ability to mediate and cross fertilize between different kinds of scientific knowledge, challenge overly rigid assumptions, and enrich the range of acceptable policy options. Other research, on science itself, suggests that better-trained science and environmental journalists could find new ways to help broker the sometimes fraught, tension-filled relations between science, policy-makers, and the public. Zehr (2000) and Stocking and Holstein (1993) investigated how scientists structure ignorance claims as well as knowledge claims when they define a scientific problem and design research to address it. This means not only recognizing the presence of a gap in existing scientific knowledge but showing exactly where the gap exists in relation to what is known and, based on that structuration of the gap, exactly what kind of research design could fill it. This is part of the standard working procedures of scientists, which their training and socialization teach them to take for granted. But unlike scientists, the public’s uncertainty encompasses not only the ignorance of specific scientific facts, but also of the scientific process, and the social dynamics of the scientific community.

*Interactional expertise: another form of journalistic knowledge*

Environmental and science journalists, even without expertise in any particular scientific discipline, could nevertheless acquire what Collins (2004) called interactional expertise. Developed by sociologists of science who needed to understand and converse with the natural scientists they studied, it refers to a knowledge of scientific language concepts and thought processes without the deep knowledge of the literature and the sustained experience in conducting actual experiments that make actual bench research possible. Though this is different from scientific knowledge, it could still allow journalists to negotiate their way across different scientific topics and put opposing claims in context. Nielsen and Sørensen (2017) recognized that managing ignorance is fundamental to scientific progress and state that more experienced science journalists can play a role in brokering knowledge among scientists, the public, and policy-makers. However, Zehr’s (2000) content research showed journalists report on uncertainty in ways that take account of the public’s needs but also have the effect of reinforcing scientific authority. Less experienced journalists, without a sophisticated understanding of the role of uncertainty in scientific claims-making, may over- or underestimate the tentativeness of a particular scientific claim or a line of research.

*Case study example: the monarch butterfly paper*

Mcinerney et al. (2004) found this lack of expertise about the scientific process shapes science reporting itself. Focusing on the flow of new knowledge from scientific literature, through news releases, to the media to the public, these authors studied the heavy coverage of a single paper in the journal *Nature* on the effects of genetically modified corn on Monarch butterflies. Coverage of GM food showed a substantial increase after the publication of the Monarch paper and an unrelated story that occurred at the same time about the recall of products containing Starlink GM corn, a product not approved for human use.
Though the Monarch paper represented only preliminary findings only, it received coverage by the *New York Times*, the *Wall Street Journal*, and the Associated Press along with other newspapers, setting off a worldwide controversy over the effect of GM corn on the environment. Over time, journalists turned to activist groups for further information on genetically modified foods.

The authors say this led to social amplification of risk as industry and activists took different positions of the danger of GM food and the Monarch butterfly began to be used as a symbol in protests. In much of this coverage, the Monarch paper was presented as fact, not preliminary findings, which may have contributed to the picture of the Monarch as inevitably close to the question of GM crops for human consumption. They concluded that several levels of public relations had heavily managed the flow of news between science and the media to maximize the paper’s impact. That is, the widespread coverage did not represent merely the impartial news judgment of journalists based solely on the news value of the paper.

What could more scientifically trained journalists have brought to this story, with its limited findings, ambiguous risk calculus, and careful strategic management of the science’s meaning and importance by the administrators who crafted the release? The authors note that scientists and non-scientists assign different kinds of meanings to identical risks. On this basis, they speculate that the press release’s use of the Monarch as a symbol of general environmental loss may have had a strong effect on public risk perceptions in ways that exceed the scientifically calculated risks. The number of journalists trained in scientific estimation and understanding of risk who covered this story is not known, nor is it known how many science journalists were experienced enough to recognize the use of news releases as a form of backstage news management to control and direct coverage toward some research at the expense of other research. It is worth inquiring at this point how some form of knowledge-based science journalism might have handled the story differently.

**An alternative**

Another scenario (admittedly counterfactual) is that a critical mass of more scientifically knowledgeable journalists (or a small number working for influential outlets) might have broken what the authors call the “chain of logic,” frequently guided by non-scientists, that turned the Monarch into an emotional symbol of the dangers of GM crops. More scientifically informed journalists, rather than seeing the news release as the sole guide to this topic, might have seen a news release focusing on a particular piece of preliminary research as an incentive to look elsewhere within the research community for a more diverse range of opinions of the Monarch research (or of related research) forcing a greater recognition of the preliminary nature of the findings. Mcinerney et al. (2004, p. 67) quote Friends of the Earth as saying, “How safe is the food you eat? … If deadly toxins that kill butterflies are being introduced into our food supply, what effect are these toxins having on you and your family? … The scary answer is that no one really knows,” and note that even the most noncontroversial set of beliefs and facts can still support alternatives. Even a small amount of early coverage in the right places might have sent the coverage subsequent to this quote in another direction entirely. Fahy and Nisbet (2017, p. 54) argue in a similar fashion that ecological modernist journalists who act as knowledge brokers can “help prevent other distinct perspectives from dominating coverage, challenging all of us to critically assess expert claims and deeply held assumptions.”

Put another way, the real value of scientific training may not lie in imparting particular facts or methodologies, but in the way scientific training in any discipline might acquaint journalists with the habits of thinking valued by scientists, including the strategic management of uncertainty. As Schneider (2010) notes in her study of informal scientist-environmental journalist workshops, scientists are trained to value uncertainty and manage it. Aware of this need in their interactions with other scientists, they can still strategically reduce uncertainty in their rhetorical interchanges with non-scientists, including media and funders. Scientists also know there is no end to uncertainty, only shifts in what the uncertainty is about, while others, including journalists and their audiences, may want closure. If a large number of journalists had some form of scientific training, that training...
in itself might school them in scientific ways of thinking about uncertainty. This could alter the information asymmetry between journalists and scientists, “decentering the expert,” as Schneider puts it—rebalancing the expert/lay relationship. In the critical interaction between scientists and journalists, journalists sometimes struggled to grasp, not only the substance of a published paper, but the scientists’ overall commitment to the incrementalism of science, the need for extreme precision, careful qualification, hewing close to the data and use of acceptable language, and openness about the remaining limits and uncertainties. When they had a chance to talk, they often focused on scientists’ need to be better communicators with non-scientists. Sometimes asked pointed questions about the science but just as often tried to explain the institutional pressures of journalistic work and newsroom norms for determining newsworthiness. If this is treated as an example of how journalists can begin to gain interactional knowledge, it may be an indication of how much remains to be learned about how the process works. These questions include how much actual experience with science is necessary in order to acquire interactional knowledge, how much interactional knowledge is enough, what its components actually consist of, and whether it functions differently for different scientific sub-disciplines—Theoretical, for example, versus experimental.

This perspective on the value of scientific training gives context to Wilson’s (2000) finding of the confusion that exists among many environmental journalists about even the basic facts of atmospheric chemistry or how the general circulation model functions as well as Anderson’s recognition (1997) that environmental journalists have great faith in science itself but less faith in or understanding of particular research or particular scientists. In addition to underestimating consensus on climate change, they sometimes overestimated agreement where it did not exist about such things as the effects of increased greenhouse gases on cloud cover and whether that would have feedback effects. Berglez’s research (2011) evoked a picture of environmental journalists struggling to find new structures and rhetoric to accommodate the scientific complexities of climate change as well as its uncertainty and multiple policy implications. In the workshop studied by Schneider, journalists gained skill in the rhetoric by which uncertainty is expressed, learning to convey it more precisely and think about it more critically. One of the virtues of journalism with increased scientific training might be that increased levels of technical knowledge could also increase journalists’ grasp of the problems of managing uncertainty. Over time, this could affect the audience’s tolerance for uncertainty as well.

**Conclusion**

This paper reviewed and evaluated some of the claims and purposes of knowledge-based journalism. It examined the knowledge performance of existing environmental and science journalism with an eye toward discovering what knowledge-based journalism could change. And it explored the possibility that the scientist-journalist relationship might change for the better if journalists became more scientifically informed than in the past.

The paper also examined recent calls for journalists to bring more formal scientific knowledge and training to their work in relation to the field’s long and varied history of efforts to join the learned professions. Turning to science and environmental reporting, it located some places within contemporary journalism where the problems of knowledge-based professional practice could be empirically researched. The paper also discussed the concept of interactional knowledge as an alternative to content knowledge, one that could allow journalists to serve a brokering function between diverse science claims-makers. These insights provide a strong theoretical basis for explaining what knowledge-based journalism could accomplish for science and environmental writing and an equally strong basis for understanding and perhaps mitigating the problems to its implementation.

In their call for knowledge-based journalism for scientific controversies, Nisbet and Fahy (2015) say journalists will need to play an additional role: diffusing the polarization that frequently accompanies disputes over controversial science. This includes giving their audiences greater insight into
how and why the research was done and illuminating the conditions and assumptions under which scientific knowledge was produced, using social media to foster dialogue between scientists and audiences, and facilitating many alternative policy outcomes.

In issuing such sweeping demands, Nisbet and Fahy (as well as others) are essentially calling for journalists to play new roles that they, their superiors, their teachers, or their audience do not fully know or understand. This analysis has tried to show that professional roles, in or out of journalism, never arise in a vacuum, but are governed by a wider range of circumstances than the professionals or their audiences are aware. The ideal of knowledge-based journalism may well be attainable, especially with the new possibilities afforded by a transformed media landscape—but where in that landscape could it function best, and would it be a single thing across all media or a family of related practices depending on the medium and the users? Implementing these new roles will require an empirical effort to understand why they have not arisen on their own, the particular obstacles standing in the way of their implementation in particular places, and the paths that could ensure they become a working presence in the journalism of the future.

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