

BOOK REVIEW

SCIENCE COMMUNICATION: UNDERSTANDING ITS CHALLENGES AND OPPORTUNITIES – REVIEW OF THREE BOOKS

The Oxford Handbook of the Science of Science Communication. Jamieson, K.H., Kahan, D., & Scheufele, D.A. (Eds.). (2017). Oxford University Press, New York. xxii, 486 p. ISBN 978-0-19049-762-0 (hardcover); 9780190668969 (Ebook).

Communicating Climate Change Information for Decision-Making. Serrão-Neumann, S.M., Coudrain, A., & Coulter, L. (Eds.). (2018). Springer, Cham. xiv, 219 p. 978-3-319-74668-5 (hardcover); 978-3-319-74669-2 (Ebook).

Creative (Climate) Communications: Productive Pathways for Science, Policy, and Society. Boykoff, M.T. (2019). Cambridge University Press, Cambridge. xvii, [i], 302 p. ISBN 978-1-107-19538-7 (hardcover); 978-1-316-64682-3 (pbk). doi.org/10.1017/9781108164047.

In a world overflowing with information, much of which is freely accessible through a multitude of channels, who needs books about the communication of information, especially a large handbook? Would we not be better off with less information rather than dealing with a continuing flow of books and avalanche of information that confronts us everyday? If we stop for a moment for a reality check, however, a different view comes to mind. This can account for the recent spate of books on the subject. The COVID-19 pandemic, climate change, and other challenges facing society are amply demonstrating, now more than ever, that an understanding is needed of how information is communicated and used, particularly scientific information. Politicians, health advisors and practitioners, public sector managers, business leaders, and every citizen need access to credible, relevant, and legitimate scientific information to inform critical public and personal decisions. Our lives today and the future of society hinge on well-informed decisions.

Since at least the mid-seventeenth century, with the launch of scientific journals in London and Paris, scientists (even before this

label became common) have been interested in communicating their discoveries. However, the science of science communication is much more recent and broader in scope than scientists simply disseminating results of their studies to other researchers. As the editors of the *Oxford Handbook* point out, the science of science communication means “an empirical approach to defining and understanding audiences, designing messages, mapping communication landscapes, and—most important—evaluating the effectiveness of communication efforts” (p. 1). Although largely the product of the last three decades, the science of science communication now occupies the attention of a broad diversity of scholars who are studying how science can best be communicated in different social and political settings and who are testing a variety of approaches that employ both established and emerging technologies. Numerous books on this subject have been published over the past five years, ranging from “how-to” guides, to detailed research agendas, compendia, and other approaches. The three volumes reviewed here illustrate the diversity of treatment of the subject, ranging from broad coverage to focused attention on the major issue of climate change.

A Comprehensive Perspective: The Science of Science Communication

The *Oxford Handbook* emphasizes the breadth and depth of this field of research and practice. Edited by three notable science communication scholars and with contributions from 54 other academics and experienced practitioners, the *Handbook* provides extensive coverage through 47 chapters, plus the introduction and conclusion. The *Handbook* presents largely an American perspective as most of the contributors are based in the United States, with a smattering of authors from the UK and Europe.

As Dietram Scheufele, co-editor and professor of science communication at the University of Wisconsin-Madison, noted, the *Handbook* is both problem and solution oriented. This approach allowed the authors of the chapters to frame evidence about each theme for an audience that was envisioned to include “scholars and students interested in understanding the pitfalls and promise of a scientific approach to science communication, as well as but not primarily, those on the front lines tasked with communicating complex and sometimes controversial science to policymakers and the public” (p. 1). After the introduction by the editors, the chapters are organized

in six parts: 1) The science of communicating science; 2) Identifying and overcoming challenges to science featured in attacks on science; 3) Science communication in action: failures and successes; 4) The roles of elite intermediaries in communicating science; 5) The role, power, and peril of media for communication of science; and 6) Challenges in communicating science in a polarized environment. A “recap” essay at the end of each part provides an informative overview of the research discussed in the preceding chapters. The final chapter, an overall conclusion by the editors, wraps up the book.

Obviously, the *Handbook* is not designed as a “how-to guide” for practitioners. Instead, the intent of the book is to provide “clear-eyed” understanding of challenges in science communication and to learn from successes and failures. Science communication operates within a multifaceted system occupied by scores of intermediaries who are influenced by many factors. For example, in some jurisdictions, scientific subjects have become highly politicized, which presents a seemingly insurmountable hurdle in showing that scientific information offers solutions for environmental and health issues.

In the first part of the book, Kathleen Hall Jamieson, co-editor and professor in the Annenberg School of Communication at the University of Pennsylvania, outlines why science communication stands apart from communication in other disciplines, particularly political communication. As she states, “science communication must faithfully reflect relevant scientific norms or risk undercutting the trust that enshrines science in its privileged rhetorical place” in society. That privilege is open to partisan critique when communication fails to account fully for uncertainty in evidence or when the process to retract faulty science is slow, as was the case with *The Lancet* which took 12 years of mounting evidence that failed to confirm an association between measles-mumps and rubella vaccine and autism before retracting a paper containing the bogus claim. In contrast with political communication, which often relies on selective use of evidence and deliberate ambiguity to convince audiences of particular positions, science communication needs to “take into account the available relevant evidence, specify the level of certainty attached to a claim, and precisely specify the phenomena being analyzed or reported” (p. 22). Describing how science communication lives up to this expectation, or not, takes up most of the remainder of the *Handbook*.

After providing an overview of key features of science communication in Part 1 (e.g., the complexity of science, levels of science

literacy of various audiences, changing media landscape), the second and third parts of the book address challenges encountered in attacks on science and observations arising from failures and successes in science communication. Two chapters in Part 2, for example, consider how problems with peer review and retractions of papers open up science to questions about the validity of research findings, which in turn presents communication challenges, opportunities for misinformation and misuse of evidence to be promulgated, and public trust in science to weaken. The chapters in Part 3 discuss various subjects that have received considerable attention in both the research and popular media, namely, information regarding bovine spongiform encephalopathy (BSE) or mad cow disease as it played out in the UK; risks associated with nanotechnologies; deployment of biotechnologies, especially genetically modified organisms (GMOs) in Europe; and concerns about vaccines. The chapter on vaccines, for example, highlights how some subjects became highly politicized (human papillomavirus (HPV) vaccine), whereas others (Hepatitis B (HBV)) did not. The authors of this latter chapter (Dan Kahan, Asheley R. Landrum) argue that institutions, both governmental and non-governmental, which are involved in dissemination of information about decision-relevant science, need to consciously protect the science communication environment.

In Part 4 of the *Handbook*, attention is focused on “elite intermediaries” that fulfill roles in communicating science, among which are prominent American scientific institutions (the American Association for the Advancement of Science and the National Academies of Sciences, Engineering and Medicine); scholarly presses and journals; American federal governmental organizations, e.g., the Environmental Protection Agency; museums, primarily in the US; and funding agencies, specifically American foundations. Less obvious as qualifying as “elite intermediaries,” three chapters in Part 4 describe science communication via social networks, public policy participation mechanisms, and evidence-informed, policy making processes. These chapters are particularly informative regarding the pathways of scientific information from research to public policy and practice; they may be most relevant to readers wishing to gain an understanding of activities at the science-policy interface.

The role of news and popular media takes up Part 5 of the *Handbook*, where transformations in journalism and the media landscape

of late are treated. Interestingly, four chapters provide an overview of how the entertainment industry influences public understanding of science, e.g., through image, narrative, and satire. These chapters alone highlight the wide diversity of actors and the complex environment that science communicators need to appreciate and understand. For example, in chapter 30 (“Citizens making sense of science issues: Supply and demand factors for science news and information in the digital age”), Michael A. Xenos, professor of Communication Science, University of Wisconsin-Madison, points out that the recent massive increase in media choices means that individuals with a low interest in scientific subjects, who may be the majority, “face an information environment awash in content that is potentially both too specialized and too one-sided to be of use in developing informed and deliberative opinions on science issues” (p. 286-287). Thus, greater research “attention to the processes by which ordinary citizens learn more about science issues and the processes by which individuals form initial attitudes about policy questions related to emerging scientific developments” is needed (p. 287).

In Part 6, the largest section in the *Handbook*, today’s highly politicized and polarized context forms the overall backdrop of the 12 chapters. The prevalence of misinformation, difficulties in dealing with philosophical obstacles to science, problems in explaining uncertainties and overcoming innumeracy with many persons, and addressing public fears about powerful technologies such as genetic engineering, are subjects that pose both challenges and opportunities for science communicators. As the summary essay in this part notes, these issues emphasize the importance of understanding audiences, “specifically how audience choices, attention, biases, and heuristics affect interpretation of complex scientific subjects” (p. 455). In their introduction to the *Handbook*, the editors stated that “people are imperfect information processors” (p. 7). The pertinence of this statement becomes particularly obvious in the chapters in Part 6, which consider the multiplicity of audiences for scientific information.

A Focused Perspective: Climate Change

While the *Oxford Handbook* was designed to be comprehensive in its treatment of the science of science communication, *Communicating Climate Change Information for Decision-Making and Creative (Climate) Communications* are focused on communication about the defining environmental issue of this century, namely

the impact of climate change. Together, the two volumes present insights from research and practice but they serve different purposes. *Communicating Climate Change Information* is the product of 45 authors, whereas *Creative (Climate) Communications* is the output of a single scholar. The former provides an international perspective; in contrast, the latter is written from a largely American point of view. The former pays particular attention to the use of information in decision making. The latter describes alternative, i.e., “creative,” methods for reaching audiences about the negative consequences of environmental deterioration.

The three editors of *Communicating Climate Change Information for Decision-Making*, based in New Zealand, France, and Australia, produced the book because they believed that credible information about communication practices was needed, as well as “examples of how such information can liberate us from the traps of economic and short-sighted discourses and project us into a future of solidarity and respect for one another” (p. vii). The prevalence of misinformation disseminated by climate change deniers, and deliberate resistance to global efforts to reverse or mitigate anthropogenic forces contributing to climate change, motivated production of this book. In 15 chapters, the contributors provide a “snapshot of how climate change information is bridging natural/technological sciences and social sciences,” and also describe “aspects of evidence for policy implementation and participatory approaches to knowledge generation” (p. 7). The snapshot is actually quite wide in scope, as studies conducted in North and South America, Europe, Asia, and Oceania are included. This book warrants notice because of its attention to the many factors involved in the interplay of information and people in policy development and practice. For example, in a chapter entitled “Transforming Climate Change Policymaking: From Informing to Empowering the Local Community,” Michael Howes, an adaptation scientist at Griffith University, drew on several research projects and case studies in Australia, the USA, and UK to derive a policy proposal that “uses climate change knowledge to inform, engage, and support democratic, local community-based adaptation” (p. 139). This proposal identified three key steps: “1) Provide credible, salient, and legitimate public information that is easy to use; 2) Create decision-making processes that are participatory and transparent; and 3) Provide well-targeted financial support and incentives” (p. 146). While these steps are not

new ideas, Howe's synthesis adds weight to similar conclusions of numerous other studies, which together emphasize that the content of information products and communication processes are closely interlinked in effective science communication. Gaining an understanding of this interaction is not a trivial task, but that understanding is needed to overcome the "patchy" uptake of the available climate change information by decision-makers (p. 6).

Overall, the chapters in this book describe results arising from studies around four questions: 1) What climate change information is needed and known? 2) How is new climate change information developed and shared? 3) Who shapes and applies climate change information? and 4) When is climate knowledge useful from local to global scales? In considering these questions, the contributors highlighted both research perspectives and practical experiences. Since circumstances affecting the communication of information vary widely, even within settings of close proximity, their discussion of methods and tools created and tested in several developed and developing countries are instructive. As the editors noted in the introductory chapter, interdisciplinary research and experience is central to advancing understanding about the communication of climate change information, which includes "interactions between scientists and citizens or representatives of entities at risk (cities, ocean, biodiversity, climate)" (p. 3).

The overall tone of *Communicating Climate Change Information for Decision-Making* is both hopeful and positive, even though the editors emphasized the urgent need for climate change mitigation and adaptation compounded by the seeming limited use of relevant scientific information. Maxwell Boykoff, Director for Science and Technology Policy Research at the University of Colorado in Boulder, also took a positive stance in *Creative (Climate) Communications*. He proposes "out of the box" thinking about how to confront obstacles in communicating information on the impending societal fallout from climate change. Rather than directing efforts only on overcoming problems with communication methods already deployed, he argues that attention could be more productively focused on other approaches and techniques.

Although *Creative (Climate) Communications* suffers from repetition, cumbersome writing style, too many examples and citations, and instances of theoretical models dropped into the text without adequate

integration, all of which could have been resolved by competent editing, this book offers a perspective about science communication that merits careful consideration. Boykoff takes readers through a review of the troubled landscape of communication and responses to climate change, particularly in the United States, where many efforts have been caught up in an immensely polarized atmosphere about this subject. Like other science communication researchers, including the editors of the other books in this review, Boykoff critiques the long-standing information-deficit model, which assumes that the reason decision makers (both public and personal) have not taken action on problems is due to a lack of information. This model implies that, because the facts will speak for themselves, supplying more information will resolve the matter. As Boykoff shows from a review of the literature, the deficit model inadequately accounts for the wide array of information pathways common in society. However, rather than fixating on the shortcomings of an inadequate model, he urges readers to consider creative communication strategies that “involve experimentation, risk-taking, openness to other points of view, suspension of stigmatism, and a willingness to possibly make mistakes” (p. 44). This perspective is well-illustrated in Chapter 4, “Ways of Learning, Ways of Knowing,” where Boykoff highlights the use of comedy and laughter as effective communication techniques. Drawing on examples from theatre, movies, and television shows as well as his own experience in conducting a student video competition, “Stand Up for Climate Change,” over several years, Boykoff demonstrates that communication employing comedy has the ability and capacity to increase the “salience of climate change.” In addition, humour offers the opportunity to expose audiences “to new ways of learning about associated threats, challenges and opportunities” (p. 106). Overall, Boykoff shines a spotlight on the unfilled potential of creative communication methods that attend to experience, effect, emotion, and aesthetics, which could be applied in the context of the significant issue of climate change, as well as “many analogous political, cultural and societal issues coursing through the veins of collective society” (p. 37).

Overall Perspective: The Three Books Together

The editors of the *Oxford Handbook* state in their introduction that how scientists and other science communicators “express themselves can affect the career of information as it makes its way through the

complex of intermediaries and institutions and processes that the science communication environment comprises” (p. 4). While some intermediaries, e.g., environmental non-governmental organizations, received short shrift in all three volumes, these books amply show that in today’s society, the expressions and pathways of scientific information constitute a very complex subject. Whether one examines the subject with an internal facing lens, i.e., looking at the social and cultural functions of information within scientific communities themselves, or with an external focus, i.e., considering the dissemination and value of scientific information in society at large, there is much to consider and understand. Yes, more and more books about the subject are being published, and more will be needed. Jamieson, Kahan and Scheufele framed the *Oxford Handbook* within the context of communication about the health threats of the Zika virus that dominated attention as they were preparing the volume in 2016. Four years later, a much worse health crisis, the COVID-19 epidemic, has gripped the globe. The significance of scientific information and communication processes has taken centre stage. Every actor in the information system – scientists, information intermediaries, decision makers, and citizens alike – needs to appreciate the value of scientific information in today’s society. For the most comprehensive current treatment of the subject, readers should consult the *Oxford Handbook*, which though large, is structured to aid selective reading. To gain an understanding of the role of scientific information for policy and practice regarding climate change, readers can turn to *Communicating Climate Change*. Readers wishing to “think outside the box,” about strategies and methods for communicating scientific information, can check *Creative (Climate) Communications*. The science of science communication has come of age but understanding communication activities is by no means complete. Thus, we should not be perplexed by a continuing stream of books on this subject.

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