

# *Book review:* **Understanding the art of science journalism: developed and developing country perspective**

Toss Gascoine, Bernard Schiele, Joan Leach, Michelle Riedlinger (Eds) with Bruce v. Lewenstein, Luisa Massarani, Peter Broks (2020), “Communicating Science: A Global Perspective”, Australian National University Press, ISBN: 9781760463656 (Print edition). Reviewed by:

**Ashish Gosain, Centre for Studies in Science Policy, Jawaharlal Nehru University**

## **Abstract**

The book positions the right to science, as a socio-cultural right, in the contemporary context. It does so in terms of discussing the pedagogical counterparts of public understanding of science and science communication. It begins by articulating the boundary limiting features of this field of academic discourse, by establishing its emergence, using developmental activities signifying policy and academic impetus like the establishment of science communication centres, the establishment of dedicated academic journals, academic and research courses etc. The author introduces the sociology of knowledge perspective to an aspect crucial to science communication: its professionalization.

In terms of particular fields of communication, the authors trace and offer deep insights into how science communication has as a field come into its unique trajectory, using the ignored contestation between science com-

munication per se and public understanding of science. Thus, the gap between public perception of science and scientists as an epistemic community of practice is under exploration. This attempt occurs in an infrastructural setting of lack of specialized science Journalists, especially in Developing Countries.

Among other themes under exploration in the book relates to participatory or citizen science and its interaction with indigenous knowledge systems, cultural cartography approaches exploring evolving dynamics of different domains of knowledge and practice. Particularly those knowledge domains, whose boundaries reshape, due to epistemic and extra-epistemic factors, to name a few. This book provides insights into the key debates in the theoretical realm and informs the practice of Science Communication, more precisely, Science Journalism, from many theoretical empirical and methodological lenses.

## Introduction

**Science Journalism is often under critique for its limitations in terms of infrastructural, capacity-linked and human capital aspects across contexts. In this context, the socio-historical shaping of science communication forms part of the discussion in this book.**

In the preface to this book, Professor John Leach outlines the provocative incantation of a ‘right to science’ from a civil or human rights perspective. He tempers it with a realistic ordering within other firmly entrenched human rights. While recognizing the power of science to offer partial solutions to many problems, he underscores how understanding science can help avoid problems science has already caused. In his conceptualization, communication is both a tool and an enabler to science. His view states that access to science and its attendant benefits and opportunities is uneven in its distribution across the World. He attributes this to the concentration of gains from scientific knowledge in wealthy regions of the world. This concentration of benefits contrasts with the shifting of costs of its production to the poorer regions. Improving access to science through science communication, howsoever modest, serves to address this inequality.

The book is part of an ongoing mission philosophy of the Australian National Centre for Public Awareness of Science aimed at fostering the ‘democratic ownership of science’ and involves the cataloguing of stories of science communication from across the world. This cataloguing of case studies accounts for how science is or could be more accessible and how scientific knowledge is made accountable. This attempt at case studies involving timelines of the emergence of forms of science communication and the stories, however, avoids the ‘origin stories’ standpoint of science communication. He juxtaposes the Australian example of a rich history of sharing knowledge to countries of a relatively recent origin. In the former, he underscores the

academic and professional nature of the activity, irrespective of increasing or decreasing government support. This contrast in motivations to pursue science communication by the epistemic community provides a sharp contrast to countries, where communication is a form of activism and others, an extension of science itself. The goals of science communication have an articulation as education at certain times and a way of sharing the creation of knowledge in others and addressing items of concern - health, climate, environment, technology, and so on.

The beginning made in this field by this book outlines the ‘mess’ caused by containing all the different possibilities that a story can tell. This ‘messy evolution’ forms the character of science communication in the historical context. The methodology employed in this book includes methods of history, particularly archival, telling stories and narratives. The methodological aspiration comprises guiding future work in the field.

## Transitions from a deficit model of science communication

The emergence of science communication as a field of academic discourse is traced in its historical aspects through global trends in an emerging field, highlighting a multiplicity of understandings (Toss Gascoigne and Bernard Schiele, Introduction to the book, 2020). Concerning science communication, this diversity of interpretations is from researchers and practitioners in the field. The book has 39 country-level case studies predicated on generating an evidence base and attempting theoretical development, guiding best practices. The book also aspires to explore the interaction between indigenous or local knowledge and scientific knowledge - an area hitherto neglected. The aim of the book is engagement with people and outcomes related to that. This engagement with people and outcomes is by a participative and deliberative role for citizens. This participative and deliberative formulation of science communication is in contrast to the deficit model of science communication. The case for the deficit model of science communication understood from an activity standpoint by independent journalism (SciDev.Net, Editorial, Global Edition, June 24, 2005, quoting C.P Scott, The Guardian, June 2005) was phrased in the popular statement: “Comment is free, but facts are sacred”. The creation of a more egalitarian formulation is an important challenge for the dialogue between science and society. A critical conceptual focus is on countering irrational beliefs based on religion, superstition, ideology, pseudoscience, or anti-science. The book provides a rich comparative analysis, not based on quantifiable data alone, but on the overarching dynamics in terms of the narrative.

Among the different approaches adopted in this context to address practical problems include training of science communicators, establishing science centres and museums, organizing campaigns to lift health outcomes, science festivals and public events, media coverage of science, programs to train scientists how to communicate, besides countering superstition and fake news. Thus, the book deals with the cross-cutting issues in science communication, identify common themes, recurring challenges, and potentially adaptable innovations.

It is, therefore, apposite to discuss that some voices within developed countries reflect upon communication with the public, as one impinging on the art of science communication, as opposed to the communication within Science (Dan Rather, CBS Correspondent, 60 Minutes). This alternative conceptualization of science communication emphasizes epistemic communities of practice in shaping the boundary spanning objects of science journalism with society. There has for long been a tussle between scientists and journalists for “squaring it off” over the coverage of science in popular media and getting the details accurate (“Scientists and Journalists Square Off Over Covering Science and Getting it Right”, [Dana Smith, 2018](#), in [www.undark.org](#)). While scientists seek a “right to review” for accuracy, journalists seek privilege over sources based on ethical arguments of journalistic integrity. The photograph below shows how they are currently working at cross purposes.

**Picture Showing the “Squaring off in Science Journalism” through the coverage of Science in Popular media versus the need for accuracy (Source: Dana Smith, 2018; Photo Source: [www.undark.org](#), Malte Mueller, Getty Images).**

This conflict has contributed to the prioritization and selection of specific values in journalistic practice. Kartik Shanker, Vaishnavi Rathore and Henry-Count Evans, 2021 emphasize how values of brevity, approximation, use of the personal, colloquial, and immediate stories, words, being right now are in tension with that of science. On the other hand, science values detail, precision, the impersonal, the technical, the lasting, the facts, number, and accuracy (Quentin Cooper, Material World, BBC Radio Science Program, 2011). But a curious question concerning the aim of this book in tackling the onslaught of misinformation

is that to what extent do we have independent shaping of journalistic ethics on a cultural basis and specific to the case of Science communication to the public. It is also an institutional question as to the pursuit of certain practices in the context of tackling misinformation and its potentially undesirable social outcomes. The answers to it in the contemporary matrix of the rise of post truth across the developed world has skewed the narrative in developing countries already suffering from capacity differences. This issue of misinformation finds a general emphasis in the context of how undemocratic governments rely on falsehood. (Address by Chief Justice of India, D.Y Chandrachud, Supreme Court of India at M.C Chagla Memorial Lecture, 2021). The issue of pseudoscience and irrational beliefs based on religion, superstition, ideology has been a recurrent theme in the Indian context. During the pandemic, it has brought doctors in a sharp division with practitioners of Ayurveda, a medical system based on natural and holistic medicine on the principle basis of their fundamental tenets of practice.

The persistence of a knowledge deficit communication model accounts for four factors (Molly J. Simis et al., 2016). Firstly, scientists training results in a belief that the public audience can and rationally do process information. This belief of rational agency rests on a fundamental premise of rational choice theory and the conceptualization of democracy by Plato and Aristotle. According to some authors, citizens are rationalizing instead of rational (Lodge and Taber, 2013 in Molly J. Simis et al., 2016). Secondly, seen as a product of current institutional structures, it is due to a lack of training in communication in science, technology, engineering and medicine graduate programmes. Here, scientists having less positive attitudes about the social sciences tend to reinforce the deficit model of communication. This reliance on the deficit model depends on how scientists conceptualize the public and its link with attitudes towards it. There is a close link between scientists perception of knowledge deficit and the individuals that comprise the public. Another reason for its self-perpetuation arises from its ability to shape public policy for science issues. Here again, community engagement is a crucial strategy to uproot the deficit model of communication. The role of knowledge arises in this context, yet trust and other predispositions displace knowledge in certain situations. The rationale for scientists is not to garner support for their work alone but are instead motivated by various intrinsic and extrinsic factors and the benefits from such communication in generating an informed citizenry.

The book commences with documenting a timeline analysis of key science communication events. These survey responses are from 17 respondents concerning details of 15 timeline events on a pilot basis. Events include viz. establishment of first University course training science communicators and developing research pedagogy on the academic field. Further, forming organizations and associations of science communicators, conferences, meetings, and publications in this area professionalized science communication practice. In addition, employment avenues followed by the development of a vocabulary of science popularisation, public understanding of science, vulgarisation, social appropriation of science did characterize the National experience in this context. Later, the number of respondents went up to 45. The development of the book on the back of a single case study from Ireland and Conference proceedings is an interesting case in the functioning of the communities of practice within Science Communication in itself (pp. 2-4). The evolution of the book into a more inclusive and diverse focus is particularly demonstrative of how western deficit of science communication models have come under transition. The overall project is to enhance science communication's overall visibility within society and measure the same.

In the same movement, all the surveys conducted aim to assess the level of science culture of given populations and the indicators developed to this end, coupled with the surveys of all university-based science communication programs carried out in the European Union. Sociology demonstrates that the legitimization of a domain has links with its historicization and the growing interest in the history of science communication.

## **Origins of modern era of science communication and post World War II narrative - golden age over or age of confusion?**

In answering the nagging question as to the origins of the modern era of science communication, the book holds that the timelines vary from country to country. The authors divide this into the post war period (aluding to World War II) and the 19th Century golden age of science communication, before the war, as two discernible phases of its development. The latter period was under the influence of conflict, and accessible communication was not allowed on national security grounds.

The structural changes that ensued in the post war period resulted in interruptions to the normal processes.

The post war period demonstrates the social driving role of science and technology as the critical vehicle for social, cultural, and economic change matched with the pace of integrating the sciences and the economy. Among the key factors responsible for the sustainability of this movement involve training of a workforce (whose function is to develop new knowledge and new applications and acquire the skills to use the applications) in their professional and daily life.

Further, the ability and willingness of the population to adopt advances in technology and the rapid expansion of higher education came into sharp focus during the 1960s. The evolution of the post war period is rendered incomprehensible, absent an understanding of this dynamic. The narrative bears out in reports from the Organization for Economic Cooperation and Development (OECD). The emphasis on the link of national competitiveness to innovation qua the new knowledge and applications sustaining this pace of economic development. A second factor is the mobilization of national governments as key actors through the development of Ministries of Science and Technology in these countries, followed by science policy formulations. Lastly, mobilization at the population level through the development of science culture by implementing programs to promote and propagate scientific thinking and scientific knowledge. The paradigm change justifies the focus of the book on the post war period.

The modern era of science communication varies between countries depending on their situation before the Second World War and the pace of change thereafter. The authors were to select the most appropriate dates between 1945- 1980. The justification of this choice was because, during the 1970s-80s, there was a step change in the form of new interactive science museums, new employment, the opening of courses at universities to meet the demands of a career in science communication. The consolidation of this trend was evident from the formation of journals, associations and conferences devoted to this purpose and new programs to engage with the public at large. This period, the author believes, is when science communication asserted itself as a social necessity. A group of social actors is said to have emerged with shared values and practices, inventing terminologies to describe those practices and recognized as a group committed to the cause of science communication. Over the years, a second group has emerged of scholars and academic researchers who study science communication. The authors observe that they are in constant interaction. It is slightly difficult to comprehend how this happens in a scenario of multiple meanings and definitions.

The diversity of countries embodied through the case studies includes 11 from Asia, the most influential continental group after Europe and Australasia. The criticism of the eurocentric nature of the discourse arises in this context (Sara Demas, London School of Economics, 2020).

## Defying Euro centricism through sites of resistance?

According to this critique, a discursive analysis of resistance through various controversies and student protest movements, particularly the controversy within the National Communication Association in the United States, explores the epistemic strands of calls to ‘decolonize the academy. The argument rests upon examining how communication scholarship responds to epistemic eurocentric dominance. This response to eurocentric dominance provides a Faircloughian critical discourse analysis of fourteen abstracts from three influential journals. The challenge of these forms of resistance is in terms of feeding into broader political decolonial discourses. In the words of lyricist Andre Dallas (Rhoades must Fall, Oxford, 2018, 17), “... It’s the other side of history that our syllabus lacks”. The lyrics chronicle the Rhoades must fall movement in 2015 against white supremacism. This movement was where calls for decolonizing education and the reorganization of spatial relations was first under deliberation. This campaign led to Georgetown University’s decision to allow admissions on a preferential basis for descendants of slaves in atonement for their connection with slavery (Swarns, 2016). Examples abound within the western world on this front in the Goldsmiths University of London Anti-Racist Action movement (2019).

This contemporary effort of rearticulation of the decolonization project within science communication has yet to occur in developing countries. A few notable efforts by people of colour and their white allies have tried to address the systemic lack of diversity for years, with calls to ‘de-westernize’ or ‘internationalize’ dating back to the 1990s and 2000s. (Downing, 1996, Curran and Park, 2000; McMillin, 2006). Yet years later, the developed nations struggle with student and activist movements - forms of communication within society on assimilating the egalitarian ideals of justice, equality, and fraternity in ordinary life. Regular newspaper images of activist movements serve as a reminder of how easy or difficult it is to bring sites of resistance within society and to feed into the broader political decolonial discourses, in general.

Recent attempts by scholars like Paula Chakravorty, Rachel Kuoad, Victoria Grubb's article # Communicationsowhite, published in 2018 in the International Association of Communication's Journal of Communication, underscores the dominance of white male scholars and the perpetuation of the same in a normative manner. Through an analysis of primary authors and citation in top association journals, a total lack of representation of non-white scholars in 'publication rates, citation rates and editorial positions' was seen (Chakravarty, 2018: p. 254). The resulting conclusion was that the economy of knowledge production in communication scholarship 'perpetuates the ongoing universalization of a specific expression of humanity' and, in doing so, institutes 'racial subjection' (Chakravarty, 2018: 263). A need arises to unveil the colonial 'legacies of knowledge production and a desire to decenter the Eurocentrism that pervades academic scholarship, both in its content and overrepresentation of white males as knowledge producers. The various issues that have brought this to the forefront include de-westernizing/Internationalising media and communication scholarship, postcolonialism and decoloniality. These approaches have gained traction in particular periods as dominant paradigms of resistance and different levels of radicalization. Particularly political is the case of decoloniality. The legacy of this transvaluation translates in the background as we grapple with more inclusive criteria for promoting diversity, an egalitarian ideal within science communication.

## **Diversity, optimism, doubt and challenges: towards more inclusive criteria**

The book begins by basing the case studies in their appropriate context. However, its primary theses are that the disparities in wealth can sharply magnify problems, attitudes, and actions. Articulating implications in terms of defining issues and where science communication would offer a solution is apposite. While the nature of the problem and its being contingent on attitudes is somewhat evident, it results from a disparity in wealth alone. The ability to undertake appropriate actions is a funding or allocation problem that does not justify the dimensions underlying the capacity differences in undertaking appropriate actions and is slightly reductionist. The reliance on criteria like gross domestic product to base this is as flawed as it is in the developmental context. Further, their articulation of the role of religion in the social construction of knowledge, essential to the context of science communication, needs discussion. This role of religion and culture within social constructivism has implications for its project of countering irrational beliefs based on religion, superstition, ideology, pseudoscience, or anti-science.

## **Role of religion in social constructionism -**

Further, the understanding that religious attitudes shape and influence national policies on research and practice in science with consequent implications for science communication is flawed. Within the social construction theories, the role of religion often has significant overlap with more prominent, secular aspects of culture, which is a fallacy. The influential works within social constructionism like Peter Berger's *Invitation to Sociology* (1963) and his collaborative work with Thomas Luckmann, *The Social Construction of Reality* speak of the meaning of reality and knowledge as they understood it (Garrison, 2002: 236) in this context. When they spoke of reality, they meant "phenomena...having a being independent of their own volition". They spoke of a real-world, a natural world that exists apart from our knowledge of it. Knowledge, in this context, is understood "...as the certainty that the phenomena are real and possess specific characteristics". Thus seen, knowledge is a mental construct of what the World is. Lastly, despite the all-encompassing socially constructed nature of knowledge, it may or may not reflect reality. It is the view of those who hold it and is, in a sense, the natural reality of their place and social reality. This social construction of knowledge, according to Berger, is central to the "sociology of knowledge". His rejection of the pretence of thought in isolation of the social context within which things find interpretation connects the thinker to his social world. Society supplies norms, values and logic but also the store of information that institutes our knowledge.

Among the various challenges to it, the one presented by religion is that the relativism of social construction denies absolutes and undermines truth and is destructive of religion, society, and humanity. The hedonistic and relativistic nature of standards has arisen in the absence of absolutes, leading to pollution of all aspects of morality (Hamilton, 1997 quoting Francis Schaeffer in Garrison, 2002). Even secular humanists argue against embracing social relativism, as it rejects the universal nature of human rights, fundamental

premises they vigorously defend. Even Postmodernism challenges classical notions of truth, reason and objectivity. Berger's social constructionism is in the tradition of enlightenment, rationalism and empiricism. It appears as the process by which people encounter the world, interact with it, and from cultural traits that make sense. Thus, clarity in presenting the social construction of knowledge is imperative. In the variant of sceptical and qualified realism (within the critical realism tradition), Ian Barbour, Arthur Peacock, and John Polkinghorne (all men of science) are of the view that problems exist with scientific work, in contrast to received realism, where science has a primal role to science, as regards uncovering the hidden mechanisms of the world and showing us as it is there in reality. However, recent trends in science communication research, intrinsically an inter-disciplinary endeavour, are limiting as they present theoretical and strategic prescriptions that do not adequately reflect the variety and cultural diversity of science communication internationally. In this direction, an inclusive definition of science communication must revolve around the social conversation around science. (Massimiano Buchi and Brian Trench, 2020).

## **It's truly about democracy- isn't it?**

The use of the democracy index seems apposite to classifying countries, according to the developmental stage science communication has achieved. Primarily democratizing the expression of facts and opinions has been the fundamental goal of public understanding of science. The Tocquevillian ideal of participative democracy has multi-dimensional nature, which truly reflects the context of science communication. The astounding variety of science communication modes of mediation are under discussion in the book. The mainstreaming of efforts to develop scientific temper through public science events, using conventional and new age media enables a decentralized architecture for science communication. The novelty in the book lies in new approaches to science communication and practices. Science communication has actors always have to work and modify their work and discourse in response sensitive to the context, the power play involved and the social, economic and political imperatives that constitute their environment. Despite emphasizing democratic ideals at the core of science communication, critical realism (sceptical and qualified realism) dictates taking an inward view of how the scientific community functions. That view must emerge from the history of science communication.

## **The misplaced optimism of militarisation of science - the post World War II narrative.**

Before World War II, Science communication was under the self-regulation of scientists and enthusiasts. It was only in the 1970s; governments began to assert their role spurred by the direct nature of the impact of science and technology on society. But governments with a consistent record of promoting science communication activities of diverse nature are rare. A noteworthy science fair takes place in Johannesburg, South Africa, every year in the first two weeks of December. In a society currently torn by ethnic strife, this highlights the co-existence of the defective cultural enmeshing of science communication with all parts of civic life implicating irrational beliefs of any description-social, cultural, economic or political with egalitarian efforts at science communication. Despite it being low on budgetary allocation and government priority through a combination of institutional apathy, competition for funding, lack of overall commitment (despite promises of support repeatedly reaffirmed) or because resource constraints impose a form of bounded rationality in investing in such efforts.

The role of governments has assumed a passive dimension and created space for external institutions and individuals to make the necessary effort. The unsavoury state relations of propaganda and science led to private foundations funded ambitious programs to train science journalists. In the United States, the absence of a strong central agency allowed many institutions, funding bodies and societies to enter a field described as 'vibrant', 'jostling' and 'cacophonous' and characterized by a lack of coordination and centralization. Whether that helps even in resource affluent settings to a moderate role for science communication that is responsive to the needs of society at large is another matter.

Also notable is that governments have been hostile to the idea of science communication at specific points in history. Here, the role of the state became a determining factor. On a general note, governments became more interested in science and science communication when there emerged a growing belief in the power of science to unlock a bright future. Vannevar Bush, Director of the US Office of Scientific Research and Development, responded to the possibilities of science during times of peace. The visions outlined by visionary leaders underscored the need for aligning the mindset of people with science. However, the develop-

ment of scientific temper in developing countries is particularly monumental on changing long-held beliefs and attitudes, opening the people's eyes to the possibilities for better approaches to health, agriculture, and industrialization, and paving the way for people to a new future. The promotion of science communication is a life-threatening project in countries like India, on account of the nexus between the right-wing political forces and violent religious organizations resulting in anti-science statements made by the political establishment finding their way into policy instruments, invasion of scientific spaces and reducing of scientific output (Gauhar Raza et al., 2018: 40). An implicit need arose in this context for public acceptance, awareness, and education. The role of organizations like the Organisation for Economic Cooperation and Development is to assert the fundamental role of the sciences and modern technologies in modern societies and insist on government science policy formulation to foster growth. The second report in 1971 embraced a broader view of science, putting forward its social and cultural aspects. The entry of science communication into the political discourse has occurred on the back of these developments.

## Challenges to science communication: Indifference, scepticism, or superstition?

The book identifies a few challenges to science communication faces: fear of change, indifference, scepticism, superstition, competition for funding or resources, and cultural or religious differences. The different experiences of a collision between 'white man's science' and indigenous knowledge are under assessment, with resolution in sight for a few. Despite a general expectation that scientists will discuss their work and engage with society (the 'third mission'), there was limited interest by institutions, funding agencies and governments in rewarding communication work. The problematization offered in the book is one of lack of incentives for the scientific community to communicate their work to the public and the frustration resulting from the non-inclusion of their inputs into policy instruments. The question is whether the role of Media is independent of the scientific community.

In this regard, Chapter 2 outlines the timelines for developing science communication and as a media subfield. The specific indicators provided are the starting dates of radio programs or television programs. The caveats the authors outline concerning the predictive value of these indicators apply in respect of actors participating in the production of these programs and their role in other activities like the establishment of science centres, training programs etc. The internal variation between the timelines found in respect of radio and television programs shows the lack of continuous development of the former and certain context-specific factors that influence the feasibility of each medium. The discussion on the digital medium is not part of the articulation at all, perhaps because of its recent origin. The lack of neat, theoretical explanations in this context explains the overall debate on the pioneers regarding various activities, without clarifying whether the pursuit of one activity benefits from the other or merely appears as a discontinuity. The role of media is seen as consolidative of activities like the development of a journal and not in its independent right either.

Chapter 3 outlines the specific case of health communication in Africa (Margaret Kasege and Verah Okeyo, 2020 in Toss Gascoigne and Bernard Schiele, 2020). The development of the discipline in Africa was markedly distinct from the global north. This development points to a neglected contestation in the field between the public understanding of science, a paradigm that anchors the justification for science communication and science communication per se. The definition used for the latter is as a form of contact for sharing information on science in society using various means, including institutions and communication entities such as media houses'. Another definition of science communication is the 'use of the impact of the media and other channels of communication to disseminate scientific findings' with a focus on a communication process reliant on multimedia through journalistic reporting on mainstream and social media, and science exhibitions in museums (Du Plessis, 2011 in Margaret Kasege and Verah Okeyo, 2020).

In contrast, public understanding of science communication is a multifarious activity to narrow the gap between science and the people (Bauer, 2008 in Margaret Kasege and Verah Okeyo, 2020). It includes research that uses and appreciates empirical methods to investigate the public's appreciation and uptake of science- or its lack and variations across time and context. In the developed countries, the disciplinary boundaries are clear, and however, it is not the case in South Africa. This divergence on the clear disciplinary boundaries is attributable to the introduction of science in each region.

Several authors have alluded to this gap between science and the people and the common public understanding of basic science or the benefits arising from the same (Bensaude-Vincent, 2001). However, some have seen this perceived deficiency of scientific knowledge of the members of the public on the assumption

of insufficient coverage of science in the mass media and other public fora (Lubliski et al., 2014; Murcott and Williams, 2013 in Margaret Kasege and Verah Okeyo, 2020). Among the many explanations for this gap are the ivory tower approach of scientists and the arcane nature of its practices, as well as the ostensibly dispassionate scientific discourse in use by them (Allan, 2009 in Margaret Kasege and Verah Okeyo, 2020). The various measures, in terms of efforts to make the knowledge production in science - open and accessible, training scientists to be media savvy and improving the quality of science journalism are crucial. Science journalists face significant challenges while reporting scientific research in socially beneficial ways. There is an opportunity for science journalists to contribute to the open science movement by identifying and explaining significant value judgments in scientific research for the public at large. Journalists are uniquely situated as they act as gatekeepers of information, and their investigative skills should be useful in identifying value judgments (Kevin C. Elliot, 2019). This access issue is particularly relevant in the health domain because the information available to populations who depend on active personal engagement with health providers faces structural impediments. The content and scope of science education as part of the Larger Project is aligned with its unique colonial experience.

The utilitarian justification for the adoption of science education was to enable populations to improve their living conditions. Science education had mandates to improve agriculture and animal husbandry production practices. Populations could boost food production for individual use, export, and sale and improve overall health and life expectancy. Science education influenced attitudes and behaviour of the population, whereby practices were “civilized” if they emerged from science education and “uncivilized” if they were grounded in people’s beliefs and practices. Thus science communicators used this approach with media and schools. The colonial government’s attitudes were narrow concerning the provision of science education to their territories. The conduct of Higher education took place in territories elsewhere, intending to fulfil their need for a trained workforce. Thus, even when African countries became independent, science communication was limited to basic sciences to train the workforce to govern the country. Therefore, they had developmental and economic growth as priorities, accelerated through education, technology and human resources. However, the institutional transfer of power from colonizers to colonies was visible in every sphere of public life. Politics was an instrument of consolidation of the rule of governments in such newly independent countries.

The alternative of evidence-based solutions through science communication did not appear very strongly in this scenario. The public acceptability of science was lower than in the education system due to research institutions being the primary custodians of science communication. According to science communication researchers, this gap created the self-legitimization of scientists as brokers of science communication. The starting point of the Chapter is the acceptance of third parties in the development and practice of science communication in Africa. This point of reference is in terms of interests, methods and effect of third parties in the Media as the arena. This arena includes the impact of public relations and funding on science journalism, conceptualizing it under Habermas’ notion of the ‘public sphere.’ This notion of the public sphere refers to the inherent purpose of the speech act, i.e. mutual understanding through human’s communicative competence as a form of agency. The South African example demonstrates that having structured science communication events does not compensate for the absence of media coverage of science in mainstream offline media. Authors like duPlessis, 2017 in Margaret Kasege and Verah Okeyo, 2020 emphasize the importance of political factors in a society divided by colonization and racial apartheid in muzzling the development, research and use of science communication in higher learning institutions. Despite these structural constraints, science communication is a subject of research in higher education institutions. Particular examples talk about media coverage in specific issues like genetically modified crops in Kenya, provision of health information through radio communication and new age media like the Internet. Funding these research projects underscores the dependency on Western countries, which is structural to science communication as a field of study in all colonies.

The Chapter traces the trend of scientific research under private patronage since the 1970s and the imperatives of reputation management and securing market share guiding the development of knowledge products. This model of professional public relations for science appears as a domineering and generalized practice. The competition from social media platforms to traditional means of communication has changed the public communication character of science communication. The resultant pressure on science communication manifests in compromising the public nature of communication and knowledge dissemination and focus becoming skewed towards few scientists, products, and research institutions framing the discussion. The result is the risk of scientific fraud and lowering of the quality of social conversation of science. The chapter also outlines the structural constraints arising from the situation, like fewer resources to check the information. The requirement of a public sphere is thus necessary for the development of science communication through

independent scrutiny of the knowledge production process and support for peer review mechanisms. The authors link the diminished public participation on health issues and challenges with the development of practical insights into issues affecting the same and the provision of viable long-term solutions for them. The development of science journalism as a specialist field has been inclusive of scientific communities perspectives. It influences the entry-level requirements and pedagogical development of courses and the background of instructors that conduct teaching activities. The situational factors of professionalization of science communication have led to the development of structured courses at universities, research institutions etc. The future directions of a trained workforce specializing in research on science communication entrench itself firmly in this context. They discuss how the current research environment can widen the gap between scientists and the public at large in view of the unidirectional exchange of information from the public to scientists. The relative non-communication of outcomes generated from research to the public widens the Informational deficit between the two. This increased gap occurs because of the lack of feedback mechanisms with and to the public at large.

A few universities have undertaken the implementation of rural engagement on mapping community perception on various research projects. The increased gap between research and the public, along with structural and cultural issues, is responsible for program failure, despite funding of projects. Access to public debates and the Media is limited in nature. The specific example of GM or genetically modified crops in Kenya reveals the lack of access to research results, compared to public perceptions about the same. There are strong parallels in this context with the rollout of genetically modified crops in India, save for the fact the Kenyan example is a case of bounded rationality of actors, shown in the passive adoption of GM crops, due to constraints of food supply. This adoption took place due to a vacuum in the public debates, informed by an evidence base. What emerges is despite a public institution dominated ecosystem, facilitation of information flow has not taken place, which brings into question capacity constraints of a different nature than are routinely argued in the case of knowledge production.

Recent research seeks to reorient scientific communication to relationships with specific communities over time for meaningful engagement ([Lindy A. Orthia et al., 2021](#)). The particular engagement with various levels in the book points in this direction but does not consolidate its contribution to academic discourse in science communication. science communication in the South African example claims a universality that overlooks society's inequalities that public relations create. This notion of universality rests on the public sphere, which facilitates discussion and debate and influences public policy formulation. It is carried out on social media or at meetings (Butsch, 2007; 2011 in Margaret Kasege and Verah Okeyo, 2020, p. 58). The role of social differences in barring access to virtual information spaces is particularly visible. Fraser, 1992 outlines this public sphere's "rational deliberation" as a bourgeois individualistic social practice that the privileged meet to pursue their individualistic needs. This characterization of rational deliberation is usually seen, except for some instances, where the government tries to include all concerned in the spirit of collectivism, like in Tanzania. The authors discuss the increasing role of science communication of research funding agencies in the contemporary development of science communication. The authors outline the pressures and challenges on media houses arising from declining advertising and how foundations are attempting to finance journalism for the actual production of science journalism and capacity building. The implementation of capacity-building efforts is through training and fellowships to alleviate gaps in science journalism, viz., coverage gaps in content or depth; outright partisanship; lack of professionalism; laziness and lack of ethics. The foundations' role and activities are subject to criticism due to their alignment with areas of interest to these foundations. The authors outline the priorities of the Kenyan education system regarding agricultural subjects and the impact on education in health communication limited to few students in select institutions and therefore reduced access to science communication for the public at large. Despite these challenges, science journalism has been a cause for social change, especially in positive health-seeking behaviour. The chapter provides a discursive analysis from an evolutionary perspective in a sense with rudiments of historical development. However, the richer discourse could have been in the public understanding of science perspective, better revealing the realities. That discussion was part of the attempt in a piecemeal manner. Seeing science communication against the backdrop of science events and advances in the western world is evidence of the extent to which institution and capacity building was a primary focus of educational institutions in colonial times. The specialist needs of health communication are markedly different from science communication in general and outcomes from science-based events. The significant event of the Alma Ata Declaration, 1978, marks the watershed development in the history of health communication. Here again, the role of community health workers and their engagement within society finds emphasis. The emergence of HIV and AIDS placed the health agenda differently due to its global impact. The need for innovative information exchange mechanisms came to the forefront. The narrative on the health communi-

cation interventions attempts to address misinformation by addressing failures in implementing outcomes. The reorientation towards positive patient outcomes like mainstreaming of affected people and their rehabilitation forms an example in this context. The role of politics in health communication emphasizes this discussion through the intervention of promoting testing and counselling.

Therefore, the model of science communication appears as two distinct groups, namely those who possessed the science and those who received it as information. The context of globalization frames the discussion with an emphasis on food production and agriculture. Unique examples of community engagement for developmental initiatives with rural communities form an interesting study in storytelling and role-playing. Community health issues like the large number of deliveries done by untrained professionals is another example. Similar events and initiatives for primary and secondary school children like visits to museums, animal reserves and orphanages by popularising science are part of a bit of discussion. ScienceLink events organized and SciBraai are examples of social media using digital media. The involvement of local community platforms and coalitions promoting enhanced participation of marginalized groups like women etc., discusses diverse approaches for particular sexual and reproductive health issues, besides AIDS and HIV. The barriers to information in terms of the digital divide, state control of media and education, etc., are worth mentioning. The evolution of access to affordable treatment emerges from early-stage control of information about the state of public health facilities, arising due to political difficulties. The digital context outlined raises issues of misinformation and trust deficit. The development of science communication between researchers and users of technologies raises the true nature of communication due to a lack of feedback on the process and content of research studies. Communicating research to cause behavioural change has its challenges arising from this gap between researchers and users. The resistance to scientific findings that appeared in a socio-economic setting or on account of socio-cultural beliefs and practices provide the context-specific factors to be taken care of in science communication. The sources of information in the post-independence era underscore the role of radio as the vital source of information. The enhancement of literacy levels helped create a more extensive reach for mainstream media like print media. An optimist outline of outcomes in health communication results through this discussion.

In addition to the themes listed above, the book presents such interesting case studies on the development of science journalism. The contrasts that emerge between case studies of developed countries and newly independent colonies underscores the various facets of science communication on a culture and context-specific basis. Particularly noteworthy is the case of New Zealand (Chapter 4) on Bicultural knowledge communication and participatory science (Chapter 4), which signals a paradigm shift towards environmental activism and facilitation of other sustainable development goals. This case underscores the value of indigenous knowledge in different cultures as regards the content of science communication. Such culturally embedded approaches provide useful pointers to developing an organic form of science communication striking the right balance between the public and the research community. The authors outline how indigenous knowledge, knowledge systems and engagement processes is respected and incorporated into nationwide funding, research practice and public engagement (Jean S. Fleming, Nancy Longnecker, Rhian A. Salmon and Daniel C.H Hikuroa, 2020 in Toss Gascoigne and Bernard Schiele, 2020, p. 71, 72). Here, the initial response of the scientific community was to provide more information to address the deficit in knowledge in public. Compared to the South African example, this provides a sharp contrast in approaches. At the same time, both recognize the validity of cultural factors in shaping social realities in science communication on the ground. The importance of dialogue with the public found recognition in the early part of the 21st Century. The role of public dialogue in establishing multiple versions of the National Science Challenge underscores the science in society entanglement of science communication. Innovations in National Funding initiatives in science communication form part of numerous attempts to foster participatory science (Jean S. Fleming, Nancy Longnecker, Rhian A. Salmon and Daniel C.H Hikuroa, 2020 in Toss Gascoigne and Bernard Schiele, 2020, p. 73). European colonizers' influence in this process includes wetlands, changed land-use patterns, commercialized hunting of whales, etc. The specific context is that of geology and natural history museums. The origins of public acknowledged scientific research in the late 19th Century was driven by funds from individuals from different walks of life. The establishment of universities and the Department of Scientific and Industrial research parallels the Indian example. The professionalization of science as an academic activity frames this discussion. The emphasis on obtaining external funding and research for commercialization was a key plan. Push for modern developments in science communication came due to the perceived needs of the scientific community for gaining acceptance for new ideas or technologies. The weak development of media in this context is traceable to demographic factors. Differences of opinion arose concerning the quality of reporting between the scientific community and communication advisers. In response to the challenges, publicly funded science media centres were established and are a

key development in New Zealand. The context of disasters and specific environmental case studies, including the introduction of genetically modified crops, contrasts the South African example, where passive resistance resulted from a lack of debate in public on the science behind genetically modified organisms. The fate of the various science challenges and their subject area coverage frames the discussion on greater public engagement. This discussion appears their mission-led and interdisciplinary research nature of programs with a greater public engagement component. Addressing the deficit in public understanding of science remains a top priority. The ineffective use of a non-dialogic and deficit approach appears as an example to argue for more participatory forms of science communication. Most of the public engagement with scientific issues has been concerning health and environmental degradation, besides disasters. The structured use of mapping surveys to gauge the public understanding and attitudes towards science has been a systematic exercise. The various citizen science initiatives form part of the discussion in the chapter. Certain culture-specific practices of science communication by Maori researchers spark debates on a new vision of science. The authors offer a critique of the national science challenge on the marginalization of Maori researchers and the consequent debates arising on account of indigenous knowledge, and the dominant values of the scientific community in New Zealand offer interesting insights into the value of indigenous knowledge in framing and shaping the knowledge production and its communication. The role of education and training to facilitate these mandates finds emphasis. The success story of a bicultural science community arises in this context and greater public engagement with science.

Among other notable case studies with demonstrated discursive and theoretical divergences are the case of Argentina (where the decline of science journalism forms part of the discussion of actors and ecosystem in science communication using a cultural cartography approach), Australia, India, to name a few. Thus, the book provides a rich canvas for discussion of various theoretical approaches with a key theme of making science communication more participative and responsive to the needs of society. This exercise of socio-cultural factors and their interaction with epistemic and non-epistemic elements in the framing of science communication, particularly in the mass media, is a good read.

## References

- Chandrachud, D.Y. Supreme Court of India at M.C Chagla Memorial Lecture, 2021, Ful Text of Lecture available online: <https://www.livelaw.in/top-stories/justice-d-y-chandrachud-speaking-truth-to-power-citizens-and-the-law-speech-mc-chagla-memorial-2021-180510> (Last Accessed on August 31, 2021).
- Demas, Sara (2020), “Decentring Eurocentrism in Communication Scholarship- A discursive analysis of resistance in influential communication journals”, London School of Economics, Media@LSE Working Paper Series, available online at: <https://www.lse.ac.uk/media-and-communications/assets/documents/research/msc-dissertations/2019/Demas.pdf> (Last accessed on August 31, 2021).
- Elliot, Kevin.C. (2019), “Science Journalism, Value Judgments and the Open Science Movement”, *Frontiers in Communication*, November 20, 2019, DOI: [10.3389/fcomm.2019.00071](https://doi.org/10.3389/fcomm.2019.00071) (Last accessed on September 10, 2021).
- Garrison, Charles E.(2002), “ Inadvertent Sociology: The Science and Religion Movement Meets Social Constructivism”, *Sociological Focus* Volume No. 35, Issue No: 3, (August 2002), pp. 235-245, available online at: [www.jstor.org/stable/20832169](http://www.jstor.org/stable/20832169) (Last accessed on September 5, 2021).
- Orthia, Lindy A. et al., (2021), “Reorienting Science communication towards communities”, *Journal of Science Communication*, Volume No. 20, Issue No. 3, pp. 1-18, DOI: [10.22323/2.20030212](https://doi.org/10.22323/2.20030212) (Last accessed on September 11, 2021).
- Raza, Gauhar et al., (2018), “ Politics, religion, science and scientific temper”, *Cultures of Science*, Volume 1, Issue No. 1, pp. 39-51, DOI: [10.1177/209660831800100105](https://doi.org/10.1177/209660831800100105) (Last accessed on September 11, 2021).
- Scott, C.P. “The case for a ‘deficit model’ of science communication”, Editorial, *Global Edition*, June 24 2005, available online at: <https://www.scidev.net/global/editorials/the-case-for-a-deficit-model-of-science-communic/> (Last Accessed on August 12, 2021).
- Simis, Moll J. et al., (2016), “ The lure of rationality: Why does the deficit model persist in science communication?”, *Public Understanding of Science*, 2016, Volume No. 25 (4), pp. 400-414, DOI: [10.1177/0963662516629749](https://doi.org/10.1177/0963662516629749) (Last accessed on August 20, 2021).
- Smith, Dana “Scientists and Journalists Square Off Over Covering Science and Getting it Right”, available online at: [www.undark.org](http://www.undark.org) (Last Accessed on August 18, 2021).