

“We Have to, Like, Make Science”: Cultural Producers and the Production of Scientific Knowledge in UK Mass Media

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Abstract

Science saturates popular culture, but how might we understand the roles played by popular culture in producing scientific knowledge? Based on fieldwork and interviews with cultural producers in the United Kingdom, this article examines how cultural producers co-produce scientific knowledge and media products. This article engages with the slippery boundaries between media and scientific practices, examining the nuances, parameters and dynamics that shape the co-production of media products and scientific knowledge from the perspective of cultural producers working across television, radio, podcasts and newspaper journalism (print and online newspapers), popular science books and social media. I discuss how their media practices were deeply entangled with and productive of scientific knowledge. From carrying out their own research and collaborating with scientists, to commissioning small and large-scale scientific research, cultural

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producers supported, directly influenced and funded scientific research, most strikingly illustrated by data from the television industry. This study destabilizes assumptions about where, when and by whom scientific knowledge is produced, making the production of scientific knowledge for, with and through media practices more legible.

Keywords

media, popular culture, television, newspapers, science communication, knowledge production

Introduction

Science content is both fantasy and nightmare for television producers. In a large office with views across London I met television commissioner Chris to talk about producing science-related programs for a United Kingdom (UK) broadcaster. He talked about commissioning wildlife films on rare African elephants (never broadcast because they were never found), commissioning archaeological documentaries in the United States about asteroids that may or may not have caused the extinction of the dinosaurs, and commissioning experiments on human health. Notably, in the commissioning process, the money Chris spent funded novel scientific research at the same time as funding film crews. I asked more specifically about this part of his work:

Chris: Is it accepted that I can commission scientific experiments?

Emily: Or digs or whatever?

Chris: Yeah, yeah, I mean, it would vary. For example, the [program name]... they got a paper out of it. It would be a more likely thing to commission a program about science that was entirely new or where the results were not fairly predictable.

Evidently, the entanglement of media production processes and the production of scientific knowledge were, in Chris's work, a complicated but normal part of professional media practices with global reach.

This article takes a deep dive into the cultural production of scientific knowledge in the mass media, combining work from science and technology studies (STS) with concepts from media and cultural studies. This study investigated how experienced cultural producers across the most consumed

forms of factual, science-related media in the UK worked with science. I examined the following research question: what parameters and dynamics shape the production of media products and scientific knowledge from the perspectives of cultural producers? Drawing on 20 interviews and fieldwork with senior cultural producers over two years, I argue that their work involved more than representing or translating science and that rather they actively produced scientific knowledge while creating media products.

Building on the work of Haraway (1992), Penley (1997) and McNeil (2007) on the mutually constitutive relations between science and popular culture, as well as laboratory studies of “science in the making” (Latour and Woolgar 1986; Latour 1987, 4), I argue that the everyday working practices of cultural producers involved the production of scientific knowledge for, with and through their creation of media products. Cultural producers, in this study, were defined as professionals producing popular culture artefacts across a range of media industries, in this case people working in social media production, television and radio, newspapers, books and magazines. As a result, their media practices, concerns and motivations were sufficiently entangled with those of scientific knowledge production and scientists that distinctions between science and media practices blurred. I suggest therefore that, borrowing from Latour’s formulation, we can see “science *and* media in the making” simultaneously in the work of the cultural producers I met.

This article contributes to STS a specific example of how science and society are co-constructed through popular culture, beyond what Erickson (2016, 62) calls the “formal” and McNeil (2007, 151) calls the “canonical” spaces of scientific knowledge production; namely, the laboratory, clinic or university. It helps us to see the forms of scientific knowledge made legible through media practices as well as practices involved in co-producing scientific knowledge and media products from the perspectives of cultural producers. These findings destabilize some of the boundaries that slip into how we understand how, why, where and by whom scientific knowledge is produced.

This is not the first study to suggest that mass media do more than simply represent science, or that science in the mass media is shaped by commercial concerns (Erickson 2016; Gouyon 2016a; Mellor 2015). Rather, this deep dive into the cultural production of scientific knowledge contributes to STS by expanding our understanding of how and why scientific knowledge is produced for, with and through media products. I show how closely entangled the production of both scientific knowledge and mass media products can become, arguing that when it comes to the production of scientific knowledge, the differences between scientific and media practices become slippery. As Chris illustrated in the opening vignette, UK cultural producers

were closely involved with creating scientific knowledge for, with and through media products. They made science happen.

Mass Media and the Production of Scientific Knowledge Beyond the Lab

How might we make sense of media and popular culture as spaces that produce scientific knowledge? That scientific knowledge can only be properly produced in formal, canonical or constitutive spaces like the laboratory has long been understood as an overly narrow epistemological position (Erickson 2016; Haraway 1992; McNeil 2007). Scholars have argued that positioning culture and mass media only as representational spaces confers epistemic authority on scientific institutions and communities, keeping culture and media industries in the handmaiden role Nelkin (1995) and others so critiqued (Gieryn 1996; Hilgartner 1990; Vidal 2018). In this study, I draw on research from STS alongside media and cultural studies to argue mass media and popular culture can and do *create* scientific knowledge. It is important to note however, that conceptualizing mass media as a space for scientific knowledge production does not mean that *every* media practice involves epistemic scientific practices, but rather to argue, as others have, that such practices are possible.

One of the key things at stake in research on the relationships between science, mass media and popular culture is the epistemic authority of science (Gieryn 1996). Historians of science have, for instance, repeatedly shown how enmeshed science and culture are, through studies of archives and material artifacts, such that separating them analytically without inadvertently reifying divides between science and culture is extremely difficult (Cooter and Pumfrey 1994; Forgan 1994; Secord 2004). Historians have demonstrated, for example, how mass media quite literally produced new scientific knowledge through filming novel animal behaviors for wildlife programs or by advancing models of speculative scientific ideas through Hollywood film development processes (Gouyon 2016a, 2016b, 2019; Kirby 2010, 2011). Turning to science communication research, questions of epistemic authority where scientific practices and media practices meet have been studied in multiple and often competing ways. Understandably, a key strand of science communication research has examined the representation and transmission of science in the mass media. For instance, Silverstone's (1985) in-depth ethnography of the processes of making a science documentary—a BBC Horizon program—shows, through a detailed

account of the production process, how science is represented on television as a source of authority and information. Similarly, twenty years later Boon's (2014) study of *Horizon* highlights how science on television can be framed as a set of translation, transmission and representation practices where scientific ideas are, broadly speaking, explained to audiences.

A useful example of debates about epistemic authority, science and the mass media can be found in Collin's (1987) older but emblematic study, comparing two British television science programs. Despite noting evidence of scientific knowledge being produced in one program, Collins argued this was anomalous. Building on Latour and Woolgar's (1986) conceptualization of how scientific knowledge firms up into facts through the process of splitting away from its original context (e.g., laboratories, clinics, universities), Collins argued that mass media were spaces where scientific knowledge was primarily represented, not created. Or, in his terms, that culture and mass media are not and, in his view, cannot be "the constitutive forum" of scientific knowledge production (Collins 1987, 703). Interestingly, Collins makes this case despite noting and building on STS research about the co-construction of science and society that argues quite the opposite.

Other science communication scholars have, however, resisted the notion that epistemic authority only or primarily resides with science in mass media practices (Davies et al. 2019; Hilgartner 1990; Lewenstein 1995). Indeed, many researchers have critiqued the idea that scientific knowledge arrives, fully formed, waiting to be transmitted to audiences through media practices (Bucchi 1996; Burns and Medvecky 2016; Erickson 2016). As a result, Davies et al. (2019) have argued for moving away from a research focus on representation, transmission and the communicative efficacy of mass media formats, to see popular culture instead as a generative epistemic space for science and society relationships.

A second key strand of science communication research has done exactly this. For instance, several in-depth studies of news media producers were carried out in the United States (US) in the 1980s which critiqued discrete distinctions between scientific knowledge production and journalistic work (see e.g., Dunwoody 1980; Friedman, Dunwoody, and Rogers 1986; Nelkin 1995). These studies found the epistemic lines between newspaper science reporting and formal science blurred more than researchers had initially imagined. News reporters carried out their own detailed research, synthesizing scientific research in ways that merged investigative journalism and scientific epistemic practices, often working closely with scientists.

I also build on sociology of science research that takes the social and cultural construction of science as a focus. Studies of the production of

scientific knowledge in laboratories of various kinds have argued the epistemic practices therein were inextricably entangled with sociocultural practices, despite efforts to delineate between scientific knowledge and other forms of knowledge and practice (Knorr Cetina 1999; Latour and Woolgar 1986; or more recently Vertesi 2015). Scholars have shown, for instance, how making science is contingent on experimental and fieldwork conditions, including interpersonal relationships, patronage and institutional politics (Gibbons et al. 1994). I bring Latour's (1987, 4) idea of "science in the making" out of the lab and into popular culture and mass media to think about how scientific knowledge is made in cultural industries. Usefully, STS scholars around the world have extended this line of inquiry to examine scientific knowledge production across popular culture forms.

Notable studies of culture as a productive epistemic space for science include Haraway's (1992) tracing of primatology through popular culture, scientific research and back again; Penley's (1997) research showing the mutual imbrication of the US space agency, NASA, the US science fiction television series *Star Trek* and fan fiction; and McNeil's (2007) detailed excavation of feminist cultural studies of science in popular books, television and theme parks. Some research in this group starts with literary studies (see e.g., Choksey 2021; Danta 2018), while others mix cultural studies with science studies (see e.g., Jürgens 2023; Rees 2019). What they have in common, relevant to my argument, is a focus on the flow of ideas between cultural forms and formal science, demonstrating, importantly, that these flows go both ways. Or, in Haraway's (1992, 3) words, that "both science and popular culture are intricately woven of fact and fiction."

Echoing elements of Latour's (1987) work on the inscription devices through which scientific research is rendered visible, studies of mass media and popular culture that focus on scientific knowledge production often take the public element of these practices as a key epistemological feature. Or, put differently, the idea of discovery still shapes how scientific knowledge production is understood, and the verification of discoveries still requires witnesses. From this perspective making science public and enrolling television audiences or newspaper readers as witnesses can be understood as part of the production of scientific knowledge (Erickson 2016; Gieryn 1996; Haraway 1992). Importantly, for theorizing science and mass media relationships, such studies acknowledge the centrality of spectacle, demonstration, explanation and witnessing as processes of scientific knowledge production (see e.g., McNeil 2007; Shapin and Schaffer 1985). This study builds therefore on multiple threads that cross STS research to investigate mass media as a productive space for scientific knowledge.

Alongside STS research this article also builds on media and cultural studies scholarship to examine the production of scientific knowledge in the mass media through the experiences, views and practices of people making media products. Specifically people working in nonfiction, science-related products across different media, from news journalists (print and online), magazine editors, television producers and social media producers, to radio and podcast makers. Or, to again adapt Latour's (1987) framing, people involved in media in the making. Of course, research shows that beyond the Global North, the rationales, funding models, and labor practices involved in cultural and media production vary (Milton and Mano 2022). The empirical research for this article took place between 2021 and 2023 in the UK, where science-related media have a long history and have at times influenced practices elsewhere (Boon 2017; see e.g., Gouyon 2014).

Here I draw on media and cultural studies, specifically, cultural industries theory, to think about how scientific knowledge might be produced through media practices (Garnham 2005; Hesmondhalgh 2019; Throsby 2008). I use cultural industries theory to understand the experiences and practices of cultural producers across media, rather than focusing, as many studies do, only on one medium or product.

A cultural industries approach examines the conditions, structures, practices, motivations and logics that shape the work of cultural producers and their products (Saha 2018; Throsby 2008). Cultural industries theory highlights the threads that link different media and the experiences of workers because, as Hesmondhalgh (2019, 16) argues, "they compete with each other for the same resources." That is, they are in competition for funding, workers, content, and the attention, time, money or other support of audiences, users, readers or consumers (Dent 2020; McRobbie 2016). So even though specific organizations—such as the BBC in the UK—may draw on what Born (2004, 7) refers to as "public service" criteria, especially around science-related content, media institutions operate nonetheless within a highly commercial broader context (Saha 2018; Wood and Kay 2021). From this perspective we can understand the different kinds of people, practices and products I encountered during fieldwork as working in related complex media industries—whether they created television shows, online news writing or popular science books (Hesmondhalgh 2019).

Cultural industries theory provides a framework to examine science in the mass media, where so many different media co-exist and remain key sources of public information about science. Research suggests that, in the UK and around the world, television, print media (and their online counterparts) remain the main sources of scientific information for most people

(Eurobarometer 2021; Funk et al. 2020; Kantar 2019). After these, the second tranche of key media are online content and social media in Africa, China, Europe, Latin and North America (Gastrow 2015; Jia 2022; Moronta-Barrios et al. 2021). Interestingly, research also suggests that people who are largely excluded from other forms of science education and science communication still engage with science through the mass media (Dawson 2019). Each of these media, specific genres, formats and particular science themes has its own literature, but building on cultural industries theory meant this study could examine science-related UK mass media across media, genres and topics. Cultural industries theory provided a way to understand cultural producers' experiences, shared practices, motivations, histories and logics, and how these shaped the co-production of scientific knowledge and media products.

Research Methods and Analysis

To investigate the production of scientific knowledge through media practices from the perspective of cultural producers I began by mapping the popular culture and mass media landscape in the UK, in relation to science content, through existing research on mass media, science and audience engagement (Dawson 2019; Ipsos MORI 2014; Kantar 2019). Television, online and print newspapers, radio, magazines, popular science books, social media and podcasts were the most popular science-related media among UK audiences and were earmarked for fieldwork. The cultural industries theory used in this study gave another justification for working with people from a range of media, rather than focusing on one medium, format or professional role, in order to examine where practices and perspectives overlapped and differed (Hesmondhalgh 2019). On this basis I conducted fieldwork and interviews over two years (2021–2023) in the UK with senior cultural producers from a variety of roles and media.

Fieldwork was carried out in two phases. A first phase was carried out with cultural producers to follow up the mapping exercise and meet potential interviewees. Through visits to large and small media organizations, I identified suitable interviewees, as well as other people that they suggested I meet. In the second phase, which took place over the course of two years, I interviewed 19 people, consumed their media products and others that they suggested, and continued to informally meet them and other cultural producers. Or, to put this method in Tolson's words, I was "hanging around and talking to people" (Hanson, Tolson and Wood 2013, 782). I used field notes to record visits and experiences with media products, which

supplemented the interviews by providing more context about cultural producers' work.

The study had ethical approval from University College London and followed the British Sociological Association research ethics guidelines. Consent was repeatedly negotiated with interviewees throughout fieldwork. Before analysis, interview transcripts were returned to interviewees so they might change, delete or add to the conversation. All transcripts and field notes were pseudonymized, for interviewee names, organization names and the names of any colleagues or specific media products mentioned. Senior professionals in UK mass media are potentially easily identified, even across industries. As a result, their media products are not discussed in the analysis sections of this article because, read alongside the interview data and demographic information, it could identify interviewees. The demographic information below is purposefully vague for the same reason.

Data generated through fieldwork (interview transcripts and field notes) were indexed in an NVivo database and analyzed. Data were analyzed first for emergent and divergent themes related to working with science and producing scientific knowledge, following standard qualitative data coding processes (Miles and Huberman 1994; Lewis and Ritchie 2003). A cultural industries framework was applied to the data, to examine examples of shared practices, dynamics and parameters, for instance, around funding scientific research, relationships with scientists and motivations (Hesmondhalgh 2019). Finally, as is common in qualitative studies, these two analyses were combined to understand how cultural producers produced scientific knowledge with, through, and for media products (Guba and Lincoln 2005).

I approached interviewees on the basis that they were experienced, widely respected within their industry, currently active in their roles, and regularly worked with nonfiction,¹ science content. All interviewees had a minimum of 10 years' media experience. Interviewees came from a mixture of industries, professional trajectories and genres. At the time of interview, the industry breakdown was as follows: television ($n=6$), social media and podcasts² ($n=6$), radio ($n=3$), books ($n=2$), newspapers ($n=2$), and magazines ($n=1$). Notably, at that moment, one interviewee held two jobs (newspaper journalist and book author).

For all but six interviewees, careers were marked by moving between media. Thus, across their careers, nine interviewees had worked in television, six in social media, five in radio, five in podcasts, four for national newspapers, and two authored popular science books. As senior cultural producers, interviewees also held a variety of professional roles through

their careers. As I note next to relevant data in the analytic sections below, interviewees included senior magazine editors, television commissioners, senior radio producers, and so on. Only three interviewees described themselves as science journalists (notably not the ones with science degrees). During fieldwork all interviewees were highly regarded within their industries, half had won media prizes, and all held senior positions.

Turning to interviewees' personal backgrounds, one had a PhD in a scientific subject, and all but one had a university degree, though only five of these were science degrees. Two studied media at university and a further two had undertaken highly regarded media training schemes. Four interviewees described themselves as cisgender men; 15 as cisgender women. 14 identified as White British, five as British-Caribbean or British-Asian.³ Most interviewees identified as middle class, only one identified as working class.

Of course, 19 people does not make a representative sample. Instead, as is common in qualitative research, interviewees were approached on the basis that they might extend the dataset (Thomas, Bloor, and Frankland 2007). Interviews followed a conversational, semi-structured approach (Kvale 1996). We started with career-history prompts, discussed their daily work practices, the shape of their industries, and then moved to questions about how, where and why science was involved in their work. Most interviews lasted two hours, with outliers of one and five hours. Interviews were carried out in person or online, at their office, my office, or another space depending on interviewee preference, and were audio recorded. I interviewed one person twice, creating 20 interviews in total.

The Parameters of Producing Scientific Knowledge With, For and Through Media Products

What parameters shape the production of scientific knowledge from the perspectives of cultural producers? Scientific knowledge was produced by the cultural producers I met in three main ways. In this section I discuss first how they generated scientific knowledge themselves and second, how they paid scientists to do research for them. Third, as I discuss in the next section, they also collaborated closely with scientists to produce scientific knowledge together, most vividly illustrated by examples from the television industry. Despite presenting these themes in three parts, I must note that these analytic divisions were, in practice, more slippery, blurred and not always clearly demarcated.

Carrying out their own research was standard practice for all the cultural producers I met. In many cases their research did, of course, involve reviewing existing research to represent rather than produce scientific knowledge. Here, as extensively detailed in Silverstone's (1985) study of how television science documentaries are produced, the television producers I met employed specialist researchers to compile vast tranches of preexisting information about particular stories as the starting point for fleshing out scripts, filming plans and, after filming, to carry out fact checking. But, thinking with Gieryn (1996), McNeil (2007) and other STS scholars, this work tended to revolve around summarizing scientific knowledge, rather than creating or re-analyzing it.

But cultural producers own research went, at times, beyond compilation to produce new scientific knowledge in a variety of ways. Newspaper journalists (online and print) and popular science book authors produced new scientific knowledge by synthesizing existing scientific data into new forms and carrying out novel research to contextualize or interrogate data. For Maya and Tara, both journalists and authors of best-selling popular science books, a key trick of their trade was, in Maya's words "being more investigative in my approach." Both had trained as investigative journalists, much like Michelle (television science news reporter), Becky (newspaper reporter) and Kim (magazine editor). As a result, they were accustomed to, as Michelle explained, "really committing to understanding something in a way other news organizations might not." For them, this commitment meant carrying out a lot of new investigative research, from interviews and fieldwork, to cross-referencing with other texts or datasets and re-analyzing data.

Perhaps the most literal example of cultural producers producing new scientific knowledge themselves was when they generated new data through their own research. Radio producers Dana and Cait, for instance, both described series launches that showcased new survey data at what Cait described as "large scale, live public events that link to the programs." As Dana explained, "We'll launch the [name] survey, then have a program revealing the research, that's just something that radio does." Not all these forms of research produced entirely new concepts, but in some cases the knowledge produced was more strikingly novel, as with population level mental health surveys. For instance, as podcast and social media producer Lola explained,

the podcast has been groundbreaking because no-one was talking about [specific health issue] on the interwebs, and we've put out new interviews, new survey data.

These practices quite literally involved cultural producers producing new data about, for instance, Black women's experiences of menopause or trans women's experiences with health systems and services, as part of creating a media product.

Cultural producers carrying out their own research slid messily into a second key scientific knowledge production practice; paying scientists to do new, often highly specific research for particular cultural products instead of doing it all themselves. Becky, a newspaper journalist, explained for instance that she regularly paid scientists to do research for news articles. She described commissioning new data on international plant distributions for a piece on Brexit and paying for scientists to design new models of specific phenomena. Similarly, magazine editor Kim described paying scientists to create novel data sets by using their expertise to cross-reference data bases on health conditions to provide information for magazine features. Television producers talked about funding individual scientists to present shows, to contribute to research for programs, and to carry out small-scale experiments on and off-screen. As television producer Sam, succinctly put it; "we pay scientists to do things for us."

Almost all interviewees were regularly involved in paying scientists to do smaller scale, piecemeal research for them. Sometimes this included support on the aforementioned surveys for radio and podcast producers, online content developers and social media producers paying scientists to answer their own or listener questions, which often included carrying out small-scale scientific studies. Topics ranged from those where, scientists' paid involvement notwithstanding, it is hard to consider the answers as constituting novel scientific knowledge (why is the sky blue, how do vacuum cleaners work, and so on), to others where more research was required. In this second group, scientists carried out research on subjects such as the current state of water pollution in particular rivers in the UK, or whether the National Health Service advice about breastfeeding was accurate. In these examples the underlying theories and instruments may not have been new, but new data were generated for the purposes of media content and, in at least one case, the new data changed national health policy.

One way to understand cultural producers own practices around scientific knowledge production is to see them as investigative journalism. Investigative journalist practices are common across media and were practices the cultural producers I met had been trained to use. As discussed earlier, much of the research on science and the mass media focuses on the cultural production of *representations* of science (Davies et al. 2019). But the data from this study demonstrate this is not all that happens.

What I found in this study substantiates what others have argued, that the boundaries between investigative journalism and epistemic scientific practices are more porous and more contested than they might first appear (Mellor 2024; Nelkin 1995). Indeed, Gieryn (1996, 211) critiqued the view that “journalists cannot do science, and they should not try” as “savage cultural cartography,” arguing that investigative science journalism is rarely utterly distinct from scientific knowledge production. Instead, data from this study provides clear examples of cultural producers producing scientific knowledge for the purposes of creating interesting media products. In other words, that investigative journalism, media practices and scientific knowledge production were tightly entangled and hard to tease apart.

Funding, Directing, and Collaborating: Scientific Research and the Television Industry

Television was the industry where interviewees described larger-scale and longer-term collaboration with scientific organizations and scientists. These larger projects fold into the third theme of close collaboration between cultural producers and scientists to produce scientific knowledge in ways that exceed practices of investigative journalism and slide into funding and directing scientific research. This third mode of scientific knowledge production in media practice was confined in my fieldwork to television production since their budgets, though much complained about, were significantly larger than those of the other cultural producers I met. “Did some of the money from our program trickle into the excavation?” television executive Edward asked rhetorically during our interview, “almost certainly” he answered himself. As this quote suggests, echoing the data quoted at the start of this article, the cultural producers I met who worked in television saw the creation of novel scientific knowledge for media products as standard practice when making science-related programs.

I was regularly told and shown how television producers, directors, executive producers and commissioners regularly commissioned, funded and directed the production of novel scientific research to create content for television programs. Examples included archaeological digs, biological research on human bodies in film studios specially designed and built for data collection, health research on diets, sleep, childhood, and engineering and physics research on whether particular objects might fly or explode. Siân, a television director, explained this to me as normal practice:

Siân: Of course, we do lots of science studies...the big studies that went on for months at a time, you know, “is coconut oil good for me,” that kind of thing

Emily: When you say you did studies, what do you mean by that?

Siân: We work with universities to do proper studies about diet, like red wine. We did a study on red wine where they would drink red wine every day and compared it to water.

Emily: And that was part of your medical show?

Siân: Yeah, it was. Those big ones were tied in with the university, because they often involved intrusive measures like blood samples, you had to have an advisor and go through an ethics board.

Emily: And you would presumably give them some funding to do it?

Siân: Oh yeah, and we kind of ran the studies really. And then the scientists would analyze it—and sometimes do the measurements. It depends, you know, their team or our team would do it. But yeah, it would often lead to papers and things.

Similarly, television executive Edward explained that certain television programs created unique conditions for novel scientific research:

When we were doing [a wildlife program] getting those animals together would not have been possible without the money I suppose. When else would you have been able to do that research? You wouldn't. And the whole of that [funding] came from us, or from [commissioning channel] and [co-funding channel]. There were papers that came out of things discovered in that program.

With these larger scale collaborations we see the television industry significantly funding and directing scientific research to produce media content. Like Chris at the start of this article, both Edward and Siân highlight the academic papers produced through their television programs not quite as badges of honor, but as signifiers that the research had been legitimated through formal or canonical science practices (Erickson 2016; McNeil 2007). As Siân's and Edward's stories suggest, close collaborations took place.

Thinking with STS research on “science in the making” these examples show the contingencies and porosity of experimental laboratory practices, scientific fieldwork, data analysis and scientific funding or patronage

(Gibbons et al. 1994; Haraway 1992; Latour 1987). Cultural producers were involved across the board with all of what might usually be seen as formal science practices. But given what STS researchers have shown about how patronage, funding, personal relationships and institutional politics shape epistemic elements of formal or canonical science over the years, cultural producers' involvement in scientific knowledge production is not so different.

This finding echoes aspects of Gouyon's (2019) research—that wildlife documentaries regularly make explicit claims within films about creating new scientific knowledge through their production practices—and aspects of Kirby's (2011) work on film as a space for developing scientific concepts; media can and do produce scientific knowledge. Building on their work, this analysis shows how cultural producers literally produced scientific knowledge with, through and for the creation of media products. In these examples from the television industry, the work of cultural producers was not a representational afterthought once the scientific knowledge has been delivered by scientists, it was thoroughly entangled with scientific knowledge production. Science in the making was enmeshed with media in the making.

The lines between the three different strategies outlined here clearly blur, but this analytic device serves to describe practices of co-producing scientific knowledge and media products that were common media practices from the perspective of interviewees. I am not suggesting here that cultural producers *were* scientists. Rather, that the data generated in this study highlights two interesting links for STS between media and the creation of scientific knowledge. First, that cultural producers were involved in the production of novel scientific knowledge in multiple ways that they saw as standard media practice. Second, that in some cases the production of scientific knowledge and the production of media products were so enmeshed that, while they were not the same thing nor without their relational tensions, neither could have existed without the other. As Dana, a radio producer and former television producer put it in the title quote when describing her collaborations with university scientists, in order to create radio programs “we have to, like, make science.” This is not how we usually frame the production of scientific knowledge, nor the relations between scientific knowledge, culture or media (see e.g., Collins 1987; Dudo and Besley 2016; Hansen 1994; Hilgartner 1990). But, thinking with McNeil (2007), Erickson (2016) and Haraway (1992), these data represent a strikingly literal example of the co-construction of scientific knowledge and mass media products. In other words, these examples open opportunities for a plurality of ways to see “science in the making” that we do not usually focus on in STS.

Co-Producing Scientific Knowledge and Media Products

What dynamics shape the co-production of scientific knowledge and media products from the perspectives of cultural producers? Contemporary mass media are a series of related, highly commercialized industries (Hesmondhalgh 2019). And, within those industries, representing science and creating scientific knowledge are subject to significant commercial pressures (Dugan 2014; Silverstone 1985). Novel scientific knowledge was, in the words of television producer Tamsin, “useful fodder” for commercially successful media products. It was, however, fodder that needed careful management. Creating scientific knowledge through producing media products was shaped by the dynamics of managing both significant risks and rewards for the cultural producers I met.

In line with cultural industries theories, cultural producers agreed it was hard to guarantee content, commissions, audiences, users, readers and consumers for media products (Hesmondhalgh 2019; McRobbie 2016). Media products are notoriously tricky to create and sell. Most media products are not commercial successes and are supported across media industries by the few that are (Garnham 2005; Lawrence and Phillips 2002). The information they deal in is hard to control, easily shared and easily scooped by competing media organizations. Once public, a story cannot be created again in the same way. Stories are also time- and place-specific; their salience, newsworthiness and entertainment value depend on context (Hesmondhalgh 2019; Mellor 2024).

Within this can of worms, producing novel scientific knowledge was a valuable strategy for the cultural producers I met. It allowed them to control access to a given science story, to outcompete rivals by laying claim to “the scoop” (by virtue of having helped to create it, funded it and, to a certain extent, owning it). Producing scientific knowledge also allowed them, to varying extents, to direct the processes by which that knowledge was made, typically in line with whatever would suit their media product best. This explanation from television producer Sam emphasizes funding and control:

we will fund this stuff because, in the same way that like, oil companies fund science. You know, cultural institutions fund science to get specific bits of science done that’s useful for them.

For Sam, co-producing scientific knowledge and media products was no different to any other industrial relationship with scientific organizations. Like other cultural producers I met, he leveraged his budget, connections

and experience to negotiate access to and a certain amount of control over the production of scientific knowledge for use in media products.

Producing scientific knowledge was a valuable strategy for the cultural producers I met and, as you might expect, a strategy full of risks and rewards. All interviewees described it as inherently risky because, in short, it could and did go wrong. Cultural producers had to negotiate not just the risks inherent in the cultural industries, but also those involved in producing scientific knowledge which, as STS scholars have shown, is a highly contingent process (Gieryn 1996; Knorr Cetina 1999; Latour 1987; Latour and Woolgar 1986). A key problem for all interviewees regardless of the kind of media they worked in was, in the words of television news journalist Michelle, “what happens when things go wrong.” Their horror stories ranged from newspaper journalists finding the chronic illness patient they had spent months carrying out in-depth medical research with and persuading to be interviewed had miraculously recovered, to social media producers finding their experiments with algorithmic bias were irrelevant in the face of new legislation. Echoing the dynamics of research in formal science spaces, long-nurtured relationships with scientists or scientific research institutions went awry, were poached by rival media organizations or otherwise soured, and experiments and field trips often yielded little of novel value (Latour and Woolgar 1986).

Examples from the television industry were the most vivid for unpacking the dynamics of the co-production of scientific knowledge and media products. For the television producers I met the stakes involved in producing novel scientific knowledge were higher, not only in terms of the funds they invested in scientific research but also in terms of whole programs and series that hinged on new and interesting scientific knowledge being created. Television executive Chris explained, for example, how hard organizing new research for wildlife programs could be. He described his frustration at funding researchers who ultimately failed to find the rare animals they claimed to have located, around which a whole international series had been commissioned. As Chris put it, “it could have been massive, but it was just a disaster.” And, importantly, an expensive disaster, as Chris sighed, “it just costs so much money to try.”

Other television producers told tales of archaeologists who misled them over the promise of dig sites, of engineering stunts that eventually proved too dangerous to film, and of overseas permits that failed to materialize undermining months of research. Hugely expensive shoots often became only a few seconds of the final film (if anything). But here’s the thing. Chris also told me about some medical researchers whose work he took a

chance on in early 2020 to make a documentary about a new illness called SARS-CoV-2. Chris explained “I just wasn’t sure how big the story was going to be, until suddenly it was a massive story.” It was an international television coup at the time in terms of novel scientific research, a newsworthy story and huge commercial success.

Evidently then, for cultural producers the risks involved in producing scientific knowledge could really pay off. If we look at television producer Alex’s explanation, we can see the dynamics of risk and reward in action:

Alex: But it’s that sort of funding of experiments, natural history shoots, archaeological digs and all that stuff, it’s not ideal. Well, it’s a very problematic TV model.

Emily: Because you’d rather not pay them 10 grand?

Alex: I’d rather not have to pay for the original research because doing something for the first time by its very nature means they might not find anything. And that’s the risk. It’s a high-cost risk. But high reward if they find something completely new, you know, it makes headlines and it makes for a great sequence.

Alex was all too familiar with the contingencies involved in producing new scientific knowledge; “they might not find anything.” We can also see in Alex’s quote that producing certain kinds of scientific research—“natural history shoots, archaeological digs and all that stuff”—gave Alex significant advantages; access to novel scientific knowledge, control over filming the process, and a newsworthy story.

The kinds of scientific research that, in Alex’s words, “makes for a great sequence” was judged in specific ways by the television producers I met. And, as you might expect, this meant certain kinds of scientific knowledge were produced through television practices, rather than others. The criteria for making “wonderful television” were clearly articulated in the following extract, by television producer Sam, while explaining the value of funding archaeological digs in order to film them:

It’s not doing some stats analysis or doing an experiment where you have to painstakingly go through the results. You’re digging in the sand, bringing something up and no one’s ever seen it before. And those moments are why we make the series, because they make for wonderful television. You’ve got a scientist who really cares about what they’re looking for, making a wonderful discovery and they’re delighted about it. You get the emotion and the shiny pay-off of an object being discovered, and often with digs they look cool as well.

We can see in Sam's comments what kinds of scientific knowledge are preferentially produced with media products; not "stats analysis" or "painstaking experiments," rather research that is entertaining and visually compelling. From Sam's perspective the gamble involved in funding archaeological digs from production budgets enabled him to tick several strategic boxes in terms of audience appeal. First, the scoop of televising novel scientific knowledge which, thanks to the funding provided, the television team can access and, to a certain extent, control; second, amazing "shiny" objects, and third, folding in the emotional narrative arc of contributing scientists.

Sam's comment echoes what McNeil (2007), building on Mirzoeff (1999), described as the televised sublime when writing about technologies of war, media and scientific witnesses. While for McNeil (2007) the televised sublime of the theatre of war was a horrifying spectacle, for Sam, the televised sublime was designed to delight—digging something shiny out of the sand that no one had seen for thousands of years—creating an extraordinary spectacle audiences would otherwise never experience. In the quote above, Sam describes a powerful affective experience and the potential audience pleasures to be derived from watching such programs. Thinking with STS scholarship, in Sam's example we can also see how audiences are pulled in to witness scientific discovery (Gieryn 1996; Haraway 1997; Shapin and Schaffer 1985).

From this perspective, the whole television process operates like one of Latour's (1987) inscription devices, very literally making the scientific research process visible. But, as other studies remind us, as did all the cultural producers I met, media production is not a direct or reliable process for witnesses (Gouyon 2016b; Silverstone 1985). The scripting, editing, the contingencies of both media and scientific knowledge production processes—not to mention the desires of collaborating scientists, executive producers, and the whims of commissioning editors—contribute to media products carefully designed to maximize audience appeal. In this mix, it is not entirely clear exactly what kinds of scientific knowledge are being witnessed. But, as STS research on "science in the making" has established, funders' whims, contingencies and representational choices also shape practices within formal science spaces (Knorr Cetina 1999; Latour 1987, 4; Latour and Woolgar 1986; Vertesi 2015). From this perspective, the dynamics shaping science and media in the making do not look so wholly different from those of the laboratory.

Conclusion

This article examined how cultural producers co-produced scientific knowledge and nonfiction media products. While cultural industries vary

significantly, working with STS concepts and cultural industries theory, I showed how cultural producers across media produced scientific knowledge through their media practices. My analysis of fieldwork, site-visits and 20 interviews carried out across two years found television producers were particularly involved in the production of scientific knowledge and media products. Their larger budgets, longer timeframes, content and format needs made them particularly well-suited to produce scientific knowledge, but their practices were echoed at a smaller scale across the other cultural industries I studied.

This study is, of course, limited in scope. We know cultural industries operate differently around the world, as does the cultural specificity of science, which suggests these practices likely differ in South Africa or Laos compared to the UK (Mellor 2024; Milton and Mano 2022). Nonetheless this study contributes novel, empirically grounded insights to STS that deepen our understanding of what it means to produce scientific knowledge through media and cultural practices.

The findings of this study destabilize assumptions about the epistemic boundaries of scientific practices, not least in terms of how, why, where and by whom scientific knowledge is produced. Cultural producers carried out their own research, funded small- and large-scale scientific studies, carried out in-depth collaborations with scientists and scientific organizations. They did so because it created exciting content for their media products and, importantly, allowed them a degree of control over and access to the stories produced through their production of scientific knowledge. These represent significant advantages in competitive cultural industries (Hesmondhalgh 2019; McRobbie 2016). While the role of mass media may seem to be a negligible part of the broader science funding and knowledge generation landscape, establishing their involvement usefully calls into question established notions of how power, money, activity, relationships, collaboration and knowledge flow through the scientific knowledge production process—notably, that power is not necessarily always held by scientific partners (Latour and Woolgar 1986; McNeil 2007; Vidal 2018).

Examining both the parameters and dynamics that shaped the co-production of scientific knowledge and media products from the perspectives of cultural producers, I found highly contingent, mutually imbricated practices. I summarize these practices, borrowing from Latour's (1987) formulation, as science *and* media in the making. For the cultural producers I worked with, their media products required interesting, novel scientific knowledge as content. In return, those scientific knowledge-making practices depended, to varying degrees, on funding and support, as they do in formal

science spaces, only in these cases the funding came from the mass media. Notably, in this study I found that the production of media products and scientific knowledge were so intertwined that they were mutually dependent in the media practices under research. Thus, this study has shown that the co-production of scientific knowledge and media products go beyond established STS arguments that representational practices are themselves epistemic practices, or that science and culture are mutually influential. Rather, this study found media practices quite literally produced scientific knowledge, in order to create content for media products.

This study contributes to STS by showing how media practices and cultural industry drivers shape and make legible certain forms of scientific knowledge. Here, thinking with both STS and cultural industries theory, we flip on its head Gieryn's (1996) formulation discussed earlier; if scientific knowledge production requires audiences as witnesses, from cultural producers' perspectives, audiences in their turn require something interesting to witness (Hesmondhalgh 2019). Preferences for producing certain kinds of scientific knowledge were evident; interviewees favored topics deemed newsworthy, popular with audiences, not too predictable, not boring, with an emotional narrative arc for any collaborating scientists who are physically attractive enough to make it on screen. Building on McNeil (2007) and Erickson's (2016) work, this study found that for television, shiny, visually spectacular research processes were particularly valuable. Drawing on studies of scientific knowledge production in formal science spaces, analytically we can see certain parallels between "science in the making" and "science *and* media in the making." Traced through this study are the contingencies inherent in scientific knowledge production and media production, relational anxieties in collaborations, careful choices about representation, and tensions around funding, failure, control and access to information that have been well established in studies of laboratories, clinics and other spaces of academic scientific research (Gibbons et al. 1994; Knorr Cetina 1999; Latour and Woolgar 1986; Vertesi 2015). Science and media in the making, as described here, expands STS understandings of the plural ways that scientific knowledge is produced, making media production practices more legible as sites where science might be made.

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Notes

1. In this study I only focused on non-fiction media production, or what television-based interviewees called “factual” as a genre.
2. Interviewees in this group did both without me purposively sampling for this overlap.
3. Of course, these homogenizing terms are problematic but senior professionals from minoritized groups in UK mass media are so underrepresented that interviewees would be quickly identified if I provided more details (Saha 2018).

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