“Far more to it than appears on the surface”: An historical investigation of the interface between space science and the British mass media

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Contents

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Abbreviations

ABSW: Association of British Science Writers.
ACSP: Advisory Council on Scientific Policy.
AIS: American Interplanetary Society.
ADS: Astronautical Development Society.
ARS: American Rocketry Society.
ASW: Association of Scientific Workers.
BA: British Association.
BAA: British Astronomical Association.
BBC: British Broadcasting Corporation.
BC: British Council.
BIS: British Interplanetary Society.
BMA: British Medical Association.
BNCSR: British National Committee on Space Research.
CBAS: Combined British Astronautical Societies.
CBS: Columbia Broadcasting System (US).
COBE: Cosmic Background Explorer.
DSIR: Department of Scientific and Industrial Research.
EBU: European Broadcasting Union (or Eurovision).
EBU ESS: EBU Eurovision and Satellite Section.
ELDO: European Launcher Development Organisation.
ESA: European Space Agency.
ESRO: European Space Research Organisation.
FBIS: Fellow of the British Interplanetary Society.
FRS: Fellow of the Royal Society.
FRAS: Fellow of the Royal Astronomical Society.
GAC: BBC General Advisory Council (or Board of Governors).
GPO: General Post Office.
IAC: International Astronautical Congress.
IAF: International Astronautical Federation.
IEE: Institute of Electrical Engineers.
IGY: International Geophysical Year.
ITA: Independent Television Authority.
ITN: Independent Television Network (or Independent Television News).
ITV: Independent Television (including ITA, Channel 4, etc).
MAA: Manchester Astronautical Association.
MAS: Manchester Astronomical Society.
MIS: Manchester Interplanetary Society.
NASA: National Aeronautics and Space Administration.

NBC: National Broadcasting Company (US).

OBFS: Outside Broadcasts, Features and Science (BBC Television Division).

OUP: Oxford University Press.

PAC: Public Accounts Committee.

PBIS: President of the British Interplanetary Society.

PR: Public Relations.

PRO: Public Relations Officer.

PRS: President of the Royal Society.

PUS: Public Understanding of Science.

RAF: Royal Air Force.

RAS: Royal Astronomical Society.

RI: Royal Institution.

RGO: Royal Greenwich Observatory.

SAC: BBC Scientific Advisory Committee.

SCG: Science Consultative Group.

SRC: Science Research Council.

UN: United Nations.

UNESCO: United Nations Education, Social and Cultural Organisation.

VfR: Verein für Raumschiffahrt (German Society for Space Travel).

ZSL: Zoological Society of London.

Abstract

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In November 1953, the editor of the *Manchester Guardian*, AP Wadsworth, responded to Jodrell Bank Director Bernard Lovell regarding a complaint over an article that had appeared on the observatory's radio telescope project. Wadsworth understood there had been much collaboration between Lovell and his journalists in regard to the construction of the article and so the complaint suggested that there was "far more to it (production) than appears on the surface". Many scholars of science and the media point to the importance of uncovering the context of production from which popular science emerges in interactions between science and media actors. However, these and many other scholars also point to the difficulty of symmetrically unravelling the production context because of the complexities of such interactions and the diverse actors and agendas at play. To view and draw out these complexities, I employ the analytical flexibility and utility of space science as a lens because the production of popular space science was of interest, and valuable, to diverse scientific and media actors. I also use a broad and triangulated selection of primary sources, including from the often-elusive media context, to explore episodes of contingency where agendas and approaches are revealed.

I hypothesise the notion of a 'common arena' to aid understandings of the context of production of science and the media. Within this common arena scientists, media professionals and science-mediating specialists met to negotiate the production of popular scientific representations. Scientific and media culture and science-mediating specialists sought authority over and identities within the arena through 'contributory expertise'. In such negotiations, popular scientific representations became a form of 'boundary object'. Across the middle of the twentieth century, and especially in the space age, popular space scientific representations were prestigious and high-profile and the subject of much negotiation. In many ways, the media gained much at the expense of science by redrawing the arena, exploiting science in the way that science sought to exploit the media. On reflection the arena is too simplistic a concept to support the rich narrative history and, in future, it is hoped, will be surpassed by a more constructivist encounter model that characterises interactions and developments at the science-media interface. Despite these

limitations, two supplementary arguments emerge from the empirical application of the arena concept.

Firstly, that the 'problem' of science and the media is historical and its origins long precede the political movement of the same name of the 1970s. In fact, the problem originated in the 1930s as soon as the traditional authority over the production arena enjoyed by scientific culture, and celebrity scientists such as cosmologist James Jeans, was challenged by media professionals. The Council of the British Interplanetary Society identified it, for example. Motivated by increased public demand for popular scientific material and intensifying competition among media industries, print and broadcasting media professionals extended their cultural authority over the common arena. This extension was facilitated because technological developments, such as satellite broadcasting, further restricted membership of the arena to those who understood the demands of media technique and were committed to serving the interests of audiences rather than science; in sociological terms arena and production authority was 'reduced' to media culture. Such developments reduced the ability of experts to directly address audiences and, thus, the influence of scientists over popular representations of science. In other words, mediation was a threat to the social authority of science. However, this problem was not mobilised into a movement because the relationship between scientific and media actors remained somewhat deferent and symbiotic. This fluidity allowed the likes of radio astronomer Lovell to continue to popularise, at least for a time.

Another reason why the problem was not mobilised, and comprising the second supplementary argument, was the development of science-mediating specialists as 'boundary spanners'. Public eagerness for popular science, and the tensions between scientific and media culture for authority over its production, provided the opportunity for new social identities to emerge in the arena. Science writers such as JG Crowther, Ritchie Calder, and John Maddox, and science broadcasters such as Mary Adams, Aubrey Singer, and James McCloy, developed who mediated between, and were expert in and partisan to, both media and science; they were intercultural boundary spanners. However, the extension of the cultural authority of the media over the arena meant that membership of the arena became predicated on producing copy and programming that served the commercial interests of the media. Combined with, and reflecting, growing popular ambivalence with science, such pressures on science writers and broadcasters to actively challenge the social authority of science were the catalyst for the mobilisation of the problem movement by the scientific establishment. This movement sought to redraw production arena authority and re-establish the influence of scientists over popular scientific representations, as with Beagle 2.

Lay Abstract

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With issues such as climate change regularly hitting the headlines and impacting upon citizens' daily lives, concerns with the public understanding of science and risk, or scientific literacy, is a major concern in modern democratic societies. The mass media is often seen as playing a crucial role in creating images and messages about science that impact upon scientific literacy. However, there has been little academic scrutiny of the processes by which these images and messages are created and produced, especially from the perspective of scientists, media professionals and science-mediating specialists at the same time. In my thesis, I explore historical instances when space science and the media have interacted, such as with Beagle 2, and put forward the notion of a 'common production arena' to help aid understandings of popular science production.

I define the common production arena as a shared space in which scientists, media executives and professionals, and science-mediating specialists met to negotiate, and extract value from, the production of popular depictions of science. In these negotiations, all three groups sought authority over production, and, thus the profile and prestige of science, for different reasons. I suggest that media culture came to dominate the arena because technological developments and intensifying competition in the industry offered control to those who understood the demands of media technique and the interests of audiences. On reflection, the arena is too simplistic a concept to support the rich and complex case histories and, in future, it is hoped, will be surpassed by a new model that accounts for, and can reconstruct, interactions and developments at the science-media interface. Despite its limitations, the dominance of media culture within the framework of the arena provides two key supplementary arguments.

First, that many scientists identified a problem of science in the media long before the scientific establishment mobilised their concerns into the political Public Understanding of Science movement in the 1970s and 80s. The Council of the British Interplanetary Society regretted the fact that media executives and professionals began to limit the opportunities for scientists to directly address lay audiences as early as the 1930s. In particular, the assertion of the mediating function of journalists and broadcasters was viewed as a threat to the social authority of science. However, this concern did not

mobilise into a movement because media professionals continued to defer much production influence to scientific experts such as Bernard Lovell, the celebrated Director of the Jodrell Bank radio astronomy observatory.

In addition, and comprising the second thesis argument, was the fact that science-mediating specialists acted as sympathetic media professionals. Science writers and broadcasters – including JG Crowther, Ritchie Calder, John Maddox, Mary Adams, James McCloy and Aubrey Singer – developed who were expert in and partisan to both media and science. However, the extension of the cultural authority of the media over the arena meant that science writers and broadcasters had to commit and demonstrate their ability to producing copy and programming that served the commercial interests of the media in attracting audiences. Combined with spreading popular disillusionment which meant that it was in the interests of media professionals to actively challenge the social authority of science, scientists were motivated to challenge for authority of the production arena again to exploit the media in the way that it had exploited science.

As AP Wadsworth, former editor of the *Manchester Guardian*, said in response to a complaint from Lovell regarding coverage of the difficulties of the Jodrell Bank telescope project, there is “far more” to the issue of producing popular science in the mass media “than appears on the surface”.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement

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Needless to say, any mistakes are the fault of the author only.

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Chapter 1

Introduction: Beagle 2

On Christmas Day 2003, millions of UK citizens woke up eager not just to open their presents but to hear news from a space probe on Mars. The British-built 'lander' Beagle 2, part of the European Space Agency's (ESA) *Mars Express* mission, was designed to look for the presence of water in the Martian soil, and thus lend credence to theories that the planet once harboured life. All around the world, scientists and non-scientists alike waited eagerly for the Jodrell Bank radio telescope to announce to the world it had received the telltale beeps or 'call sign' that signified Beagle 2 had landed safely. Yet the millions were to be disappointed, as no word was heard from the Martian surface. Though receivers continued to listen until March the following year, it was left to the project's leader, Professor Colin Pillinger, to admit that the craft had been inexplicably lost.

By most measures Beagle 2 was a failure. In particular, the project did not produce any scientific data. Yet, Pillinger and many of the mission team regarded Beagle 2 as a success because they defined success in different terms. To Pillinger and others, the interest raised in, and support garnered for, Beagle 2 exceeded their expectations. As Colin Pillinger later told Parliament in his defence of the mission, "no science project was ever like this", in terms of its profile in culture and society.[1] With sixteen million hits on the website on Christmas day alone, thousands of press articles worldwide and appearances on the prime evening broadcast news, the project had clearly infiltrated widely into the popular imagination. Rather than being an extraneous benefit, however, this public enthusiasm had been crucial to the lander's presence on the *Mars Express* mission. Though being selected to fly by ESA, Beagle 2 was £25m short in funds, and it was popular interest and public pressure that attracted the necessary commercial sponsors and the belated diplomatic backing of the UK government.

Historically, British space science activity has not captured such intense and prolonged popular attention.[2] Part of the reason for the project's high profile was the perennial human preoccupation with finding life elsewhere in the universe, and partly because the planet Mars has held an enduring fascination for many.[3] The fact that Beagle 2 was an all-British space exploration venture was also likely a factor. However, the interest raised in and support gathered for the mission was mostly a product of an aggressive and concerted

[1] Prof. C Pillinger (2004): 22-23.

[2] CN Hill (2001): 9.

[3] See, for example: R Markley (2005) and R Bradbury et al. (1973).

public relations (PR) campaign that exploited these aspects to set the media agenda. Despite the high-risk nature of the project, the Beagle 2 management team resolved "to show science and engineering live" to the public through the mass media and construct a narrative of nationalistic pioneering around the lander.[4] Pillinger was placed in charge of a small publicity team dedicated to enlisting and exploiting the attention of the media in the mission to create popular representations of the project such that they would generate public pressure for its funding. The promotional team engaged with journalists and broadcasters in media briefings, administered the mission website, recruited popular cultural allies such as the band Blur and the artist Damien Hirst to contribute to the craft's technical logistics, and Pillinger himself published the celebratory 2003 book *Beagle: From Sailing Ship to Mars Spacecraft*.

Beagle 2 was, thus, an unusually prominent example of space science in the media because the mission's publicity team engaged with, manipulated and exploited the media. Its high profile was mainly a product of Pillinger, especially, being able to appeal regularly to the public both directly and indirectly. In these appeals, Pillinger sought to stress particular images and messages about the mission such that the project was realised. Part of the reason Pillinger was able to create a powerful popular narrative around the mission was the multimedia nature of their campaign, with the project's promotional team taking advantage of the prevalence of self-mediated channels and social media outlets in the twenty-first century. In particular, extensive use was made of the Internet medium as an increasingly important means of presenting science to mass lay audiences that bypassed and circumvented mediating professionals.[5] However, media executives and professionals also deferred to Pillinger, and afforded him relatively unmediated access to mass audiences through their platforms. In this way, journalists and broadcasters facilitated the campaign narrative around Beagle 2. Pillinger was, undoubtedly, the media- and public-friendly 'boffin' face of the mission.[6]

The fact that media executives, journalists and broadcasters were complicit in framing and constructing favourable representations of the project is significant, and hints at complexities in the relationship at the science-media interface that could offer analytical insights if explored. Pillinger took advantage of what Steven Miller called a "coincidence of tensions" which in this instance meant that media professionals undermined their professional identities and expertise and tolerated the media management strategies of Beagle 2 publicists because such popularisation was judged to resonate with their

[4] Pillinger, *op. cit*.

[5] For more on how the Internet is changing science journalism see: B Trench (2007): 133-141. So far, little scholarly attention has been paid to the impact of social media on popular science production. V Colson (2011), on science blogs as competing channels for the dissemination of science news, is a rare exception.

[6] M Mean and J Wilsdon (2004): 10-14.

audiences.[7] The example of Beagle 2 suggests that interactions between scientific and media actors are not irreconcilably tense or characterised by a polarised dichotomy. The interactions also suggest that the production of popular scientific representations is a process of negotiation that both media and scientific cultures seek to maintain authority over and gain advantage from. As Miller also notes, tensions can emerge when the interests of scientific and media actors diverge and one party can gain advantage at the others expense, especially with the development of new media technologies that affect production relationships. I hypothesise that understanding the complex negotiations at the science-media interface, such as with Beagle 2, can, potentially, be aided by adopting the notion of a 'common production arena'. In this conception, varying actor groups and cultures seek to assert an identity within, or authority over, the common arena, in order to gain from the production of popular scientific material in the mass media. However, first, I provide a map of the major issues addressed in the relevant science and the media literature, and proceed from this map to outline the justification and conceptual framework for studying the context of production in the thesis.

Literature Review and Conceptual Framework: Prising open the black box of production

Few scholars have extensively studied the historical development of science and the media. To be able to draw out a picture that explains broad trends and reveals analytical insights at the science-media interface, I follow the example of science communication scholars Jane Gregory and Steve Miller in *Science in Public* in employing what they term as an 'episodic' approach.[8] An episodic approach is a broad survey that highlights for closer inspection some events and practices that can offer insights into motive, the zeitgeist, and many other aspects. Such a methodology is both thematic and chronological, and in the thesis I trace the overarching developments and the effects of critical crisis points on negotiations between scientists, media executives and professionals, and science-mediating specialists. Periods of flux and contingency are particularly illuminating because they can offer insights into the assorted agendas and cultures at play when interests diverge, and, as Martin Bauer and Massimiano Bucchi argue, such instances in science and the media have rarely been explored.[9] In particular, those instances in which media culture asserts its production authority, in which it can benefit from popular science without return, or vice versa, tensions arose. When popular scientific representations are

[7] S Miller (1994): 445-448, 451.

[8] Gregory and Miller, *op. cit.*, pp. 19-20.

[9] MW Bauer and M Bucchi (2007): 1-4.

explicitly mediated, a process that implies agency and vested interests in selection and presentation, the true agendas and approaches of actors in production negotiations emerge.[10]

This episodic approach enriches existing broad chronological studies of science and the British media that indicate and identify historical trends but are limited in their analytical scope and contextual depth, such as longitudinal content analyses. No British equivalent exists to mirror the 1990 work of Marcel LaFollette in *Making Science Our Own* in which she examines the science-society relationship from the perspective of American culture; in particular, the ideas about science prevalent in mass magazines in the first half of the twentieth century. One potential example is the Science Museum Media Monitor (SMMM) detailed in Bauer's *Science and Technology in the British Press: 1946 to 1990*. Bauer and his fellow researchers were aiming to create a "cultural indicator" for science in postwar Britain.[11] Bauer, elsewhere, argues for scholars to overcome their stigma of survey research and accept it as a powerful method of exploring relationships in popular science.[12] However, as Gregory and Miller suggest, the most important insight from such studies is that they indicate that "broader forces are at work shaping science in media", with social trends and professional practices hinted at in the data.[13] For example, both Anders Hansen and Roger Dickinson, and Abigail Clayton et al., employ content analyses to argue that production agendas in science in the media are driven largely by the demands and constraints of media culture.[14] But, as Gregory and Miller correctly point out, such largely quantitative studies do not explore these broader forces by situating "the media products in the contexts of either their production or of their receptions".[15]

Gregory and Miller suggest that the absence of extensive and contextual episodic studies of the historical development of science and the media is due to the fact that arriving at a broader picture of science in the media as a result of rigorous research is a challenge. Such research is a challenge, they argue, largely because the entities involved are an "amorphous, interconnected, mutually dependent bunch".[16] I do not view the amorphousness, interconnectivity and mutual dependence of scientists, media professionals and media-science specialists as an insurmountable and incomprehensible barrier to the examination of their interactions. Rather, I consider these characteristics as a challenge and an opportunity that allows the intersection of diverse social worlds to be analysed coherently and deeply. To do so, I follow David A Kirby and Jane Gregory's lead

[10] D Miller (1999): 206-208.

[11] M Bauer (1995): 7-8.

[12] MW Bauer (2008): 111, 124-125.

[13] Gregory and Miller, *op. cit.*, p. 120.

[14] A Hansen and R Dickinson (1992): esp. 375-376. A Clayton et al. (1993): esp. 232-233.

[15] Gregory and Miller, *op. cit.*, p. 120.

[16] *Ibid.*: p. 104.

in employing Bruce Lewenstein's 'web' model of science communication to show how media for science and their content interact in complex ways, and refer not just to science and its publics, but also how they inform, refer to, and are shaped by, each other in a self-reflexive, synthetic, dynamic approach.[17] Gail Davies applied the web model to draw out the competing visions and tensions, but also shared benefits, between the scientific and broadcasting communities in her 2000 study of the emergence of the BBC Natural History Unit.[18] I argue that the web model can be applied in a similar way to understand the development of the science-media interface. I also argue that to understand science communication using the web model requires the definition of a forum of which these actors groups share membership and in which they meet to negotiate and bridge their professional cultures.

To describe this space I considered Sharon Dunwoody's definition of a "shared space" where journalists and sources who need each other, usually for very different reasons and with different needs and motivations and behavioural norms, can tensely interact and work with the other within constructed rules to achieve their own ends.[19] Yet, I suggest that this notion of a shared space is based on outdated assumptions concerning the interdependence of the cultures of science and the media and the importance of science journalists, as many studies now show. This concept of a shared space begets, for example, what Sharon Friedman labels the "symbiotic" relationship between scientists and media professionals, a condition in which diverse entities coexist for mutual benefit and in mutual dependence.[20] However, such a model is not truly symmetrical as it does not consider the influence of conflicting pressures inside news offices, with general editors among other overlooked factors that influence negotiations in the shared forum at the science-media interface.[21] I also suggest that the notion of a shared space is unnecessarily polarising, with various authors, such as Dorothy Nelkin and Hans Peters, noting deeply rooted and divergent occupational cultures and social needs, motivations, values, goals and expectations among the actor groups, leading to much misunderstanding, tensions and strained relations.[22] These strained relations mean that the production of popular scientific representations cannot be dealt with wholly within either culture but, as we shall see in the empirical evidence, scientists and media professionals often collaborated in the forum rather than clashing.

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[17] J Gregory (2003): 25-27, 38-41 and D Kirby (2003): 247. The 'web' model originates in BV Lewenstein (1995): esp. 425-431.

[18] G Davies (2000): 432-434, 452-454.

[19] S Dunwoody (2008): 15-24, and based on the notion of a shared culture raised by JG Blumler and M Gurevitch (1981): 482 or a communications system raised by M Gurevitch and JG Blumler (1977): 270-271, 287-288.

[20] SM Friedman et al. (eds.) (1986): xi-xvii.

[21] C Palmerini (2007): 113-114, 118-119, 122.

[22] D Nelkin (1987): 1-13, 34, 159-169. HP Peters (1995): 31-34, 43-46.

To describe the forum, then, I borrow Massimiano Bucchi's term "common arena". In his study of instances of science communication at the public level, Bucchi employed the notion of the common arena as a stage in which "social worlds" intersect. Participants in the common arena combine their memberships in a specific arena with membership in this shared space in which issues are addressed whose resolution cannot be dealt with entirely within the border of a specific arena.[23] Bucchi also notes that such common arenas are usually marked by the existence of what Susan Star and James Griesemer called "boundary objects", plastic and robust recognisable conceptual references around which negotiations can rotate.[24] Bucchi, here, could perhaps have a case to answer in terms of Star's recent complaint that authors were overextending the concept of the boundary object to the point where it does not do useful work.[25] Nevertheless, I put forward the suggestion that the definition of a common arena can be applied to aid understandings of the science-media interface. At this interface, the diverse cultures or social worlds of the media and science intersect, contend and cooperate in diverse ways for diverse reasons. Participants in these intersections negotiate on an issue that cannot be addressed entirely within either culture. The issue is authority over the production of popular scientific representations. Thus, popular scientific representations become a form of boundary object which is manipulated by the actor groups involved and cultural authority over whose production is negotiated and contested. This is where the notion of a common arena is useful in that it affords a three-way symmetrical analysis of actors and interactions at the science-media interface involved in the production of popular scientific representations.[26] I will test the hypothesis of employing a common production arena as the conceptual framework to extract insights into the development of science and the media by applying the notion throughout my empirical chapters.

Various scholars note the importance and lack of rigorous scrutiny of the context of production in studies of science and the media, especially analysis of the processes of interactions and motivations involved in constructing a communicative media text.[27] Sharon Friedman, in the introduction to her book *Scientists and Journalists*, argues that there is a "black box" from which emanates scientific information packaged for public consumption, with little sociological understanding of how this packaged information is produced.[28] Though this black box of production has long since been identified, little academic attention has been focused on opening the box. Christopher Dornan argued that most analyses of science and the media fail to take into account developments in critical

[23] M Bucchi (1998): 130-133.

[24] SL Star and JR Griesemer (1989): 393.

[25] SL Star (2010): 612-613.

[26] However, the notion does not allow an analysis of reception, the context of which is outside the scope of this thesis.

[27] For example: R Holliman (1999): 273.

[28] Friedman et al., *op. cit*.

communication theory that would allow a critical scrutiny of the processes in the production of popular scientific material.[29] Ten years later, Gregory and Miller suggested that interim production analyses had revealed only the caricatures of the relationship between science, the public and the media, rather than its complexities.[30] As recently as 2010, Patricia Fara, in a response to Mark Erickson critiquing the historiography of science, called for more attention to be paid to production as well as reception in studies of science communication.[31] Production is worthy of scrutiny because its vehicles and processes decide how science is represented. Yet, the majority of studies of science and the media have approached production from the scientific context and, especially, engaged with the motivations and approaches of scientists in popularisation.

Roger Cooter and Steven Pumfrey take the view of popularisation as a communicative process, answering their own call for more critical analysis of science in popular culture. Scholarly critiques of "popularisation" show that it is a limited concept in that it only describes linear dissemination models of science communication and that it reflects the traditional dominance of scientific culture over the control of popular epistemologies.[32] However, I believe it is applicable to my thesis both as an actors' term and as characterising attempts by scientists to continue the tradition of addressing mass lay audiences unmediated by tailoring what Shinn and Whitley called their "expository science" to meet the needs of specific media and communication contexts. Here, I am utilising Bucchi and Trench's definition of popular science or popularisation which they describe as those instances in which scientists or a scientist, in some medium, for whatever motive, seeks to communicate ideas or insights drawn from elite scientific research to a wider and non-specialist public, in order to forge links with wider culture.[33] In this application, I echo Felicity Mellor's argument that popularisation is a key persuasive tool employed by scientists in reinforcing or demarcating professional boundaries.[34] I also employ Massimiano Bucchi's assertion that PR is merely an opposing modality in the science communication continuum from popularisation, and, thus, a means to extend the scientific community's control over popular discourse in marginal situations that extend its public accountability.[35] Popularisation, thus, was a means by which much of the scientific establishment sought to preserve some measure of influence over the processes of constructing popular scientific representations.[36] Scientific experts contested authority over the production of popular scientific representations because, as Tom Gieryn suggests,

[29] C Dornan (1988): 67-68.

[30] Gregory and Miller, *op. cit.*, p. 2.

[31] P Fara (2010): 92, in response to M Erickson (2010): 68-91.

[32] R Cooter and S Pumfrey (1994): 237-239, 253-256.

[33] M Bucchi and B Trench (eds.) (2008): 1-3.

[34] F Mellor (2003): 509-510, 516-517, 530-532.

[35] Bucchi, *op. cit.*, pp. 7-9, 134-147, 155-159.

[36] F Mellor (2003): 509.

they are a form of rhetorical boundary work that can impinge on the epistemic authority of science, its material resources, prestige, or power.[37] As Steven Hilgartner argued, the aim of the "dominant" discourse and practice of popularisation was to establish some measure of control over public discourse about science and to legitimate the prevailing social order.[38] In terms of the common arena notion, I argue that popularisation was a means to counter the increasing authority media culture held over the production of popular scientific representations. When this loss of cultural authority in the arena threatened the social authority of science, I argue, that the dominant concern with the 'problem' of science and the media was manifested.[39] As Christopher Dornan argues, this dominant concern is that popular coverage should portray an essentially positivist view of science and that the interfering influence of the media should be minimised. The concern with a 'problem' of science in the media performs an ideological labour in that, I contend, it seeks to establish that the norms of science and its popularisation are hierarchically dominant over media actors and the norms of media production in the common arena. This resonates with Dornan's claim that the ideological labour serves "those interests that have found in science a vehicle for the legitimation of the prevailing social order".[40]

Now, we see both the motive and the methods by which scientists contested authority over the hypothetical common arena and the production of popular scientific representations. The scientific establishment sought to protect the social authority of science by constructing a problem of science in the media and advocating popularisation to remedy this problem. Tracing and analysing the agendas and approaches of British space scientists in engaging with the media allows a contribution to the historiography of British space science that is lacking in extensive exploration of the relationship with wider culture. Only in the last decade or so have wider historical contexts and analytical methodologies been introduced and applied to the field, and it is to this tradition that I contribute. In doing so, I answer Alexander Geppert's rallying call to explore the cultural aspects of space exploration in Europe using interdisciplinary historical techniques.[41] The space-age programmes in the US and USSR demonstrated that space science can, and does, play a major role in society, both influencing, and being influenced by, everyday culture. Both Nicholas Hill in his imperialist *A Vertical Empire*, and Doug Millard's *An Overview of United Kingdom Space Activity 1957-1987*, note that in the 1950s, Britain was well placed to play a leading role in space with many high profile events capturing widespread popular and media attention.[42] However, Anders Hansson, in his study on space policy, argues that

[37] T Gieryn (1999): 1-5, 12, 337.

[38] S Hilgartner (1990): 519-520, 530-534.

[39] For example: G Jones et al. (1978): i.

[40] C Dornan (1999): 182-183, 188, 191.

[41] ACT Geppert (2007): esp. 585-588. See also: Alexander CT Geppert (forthcoming 2011).

[42] CN Hill (2001): 9. D Millard (2005): 4-5.

the "UK contribution to space remains elusive to the public", though this was, admittedly, changed by the media campaign of Beagle 2.[43] This discrepancy, and the relationship between space science and the popular sphere, has been the subject of little rigorous academic investigation. Francis Spufford's celebratory and semi-popular work on the ingenious engineers and *Backroom Boys* is one of the more extensive considerations of the space zeitgeist in the UK.[44] Indeed, as Steven J Dick, former National Aeronautics and Space Administration (NASA) Chief Historian pointed out at a 2008 conference on 'astroculture', more analysis is required of the impact of space on culture and worldviews, and "the biggest gap in this area is in relation to Europe".[45]

Part of the reason for this cultural oversight is that space history is a relatively recently developed professional discipline.[46] In addition, it has been pointed out that "space history is a much smaller affair and an even more fragmentary enterprise in Europe", though Geppert's Emmy Noether research group at the Frei Universitat Berlin is making great strides towards rectifying this.[47] Yet, in the same keynote address, Dick also noted that scholars could make a concerted effort to approach space history with "less political, technological, or diplomatic emphasis".[48] Dick is largely prescient, here, for the majority of British space science historiography falls into one of these analytical categories, as well as institutional and disciplinary studies. Much of this discourse is also either 'official', 'internal' or 'declinist', in other words written by commissioned writers or disgruntled authors who have at some point been directly involved in space programmes and experienced British policy indifference. However, space science interacts with popular culture through the media, and, therefore, studying the space science-media interface will add cultural richness to the literature on space science. The autobiographies of celebrity space scientists Patrick Moore, Arthur C Clarke and Fred Hoyle contain anecdotal evidence regarding both the opportunities and challenges involved in engaging with the media and public. But one of the more fruitful and viable methods that scholars have employed to explore the space science-media interface is to study the promotional activities of high profile scientific institutions or space advocacy groups.

There are no British studies to match Frank Winter's canonical works – *Prelude to the Space Age: The Rocket Societies, 1924-1940* and *Rockets Into Space* - on rocketry enthusiast groups in Germany, Austria, Russia and, especially, the US. Nor is there an

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[43] A Hansson (2003): 297-298.

[44] F Spufford (2003): esp. 3-6.

[45] SJ Dick (2008).

Some effort was made to rectify this by Dick himself when he edited, with Roger Launius, another NASA chief historian, *Societal Impact of Spaceflight* (2007).

[46] SJ Dick and RD Launius (eds.) (2006): vii-ix, 429-431.

[47] NASA (2008).

[48] Dick, *op. cit*.

equivalent to William Sims Bainbridge's analysis of US space advocacy as a sociological movement in *The Spaceflight Revolution*.[49] These works do engage with the BIS, though somewhat tangentially and superficially, and the scope and influence of the BIS is underplayed. More recent work, such as De Witt Douglas Kilgore's 2003 *Astrofuturism*, Millard's *Overview* and Alexander Geppert on 'Outer Space and the European Imagination' sought to rectify this somewhat, arguing that the BIS played a key role in terms of building popular space enthusiasm and institutionalising British space science as an academic and industrial discipline. However, these studies may have overplayed the Society's influence. The most detailed study of the BIS thus far is by Daniels, who attributes the genesis and early success of the Society to the vision and determined promotional nature of its founder Phillip Ellerby Cleator, but which offers little media context.[50] Similarly focused on the agendas and approach of a space scientific organisation to the popular sphere is Jon Agar's *Science and Spectacle*, in which a troubled telescope project at Jodrell Bank was constructed as a spectacle of modernity.[51]

In my case studies of the BIS and Jodrell Bank I build on and contextually enrich such studies of space scientists' seeking to exploit the media by employing the concept of the common production arena, in which scientific and media actors negotiate the production of popular scientific material. In particular, I reveal the complicit roles played by press and broadcasting professionals in constructing popular representations such that the BIS and Jodrell Bank project enjoyed public support and found their activities legitimated. The most significant revelation is the fluid rather than contested nature of the production arena, a factor that hints at the limitations of the arena notion itself that will be reflected upon the thesis conclusion. For much of the time, the interests of scientific and media actors were aligned and benefits mutual of promoting the profile and prestige of science. In many cases, media professionals and executives deferred production influence to experts such as Cleator and Lovell who were afforded relatively direct access to audiences because of the newsworthiness of their activities. Such instances meant the common forum was characterised by what Robert E Kohler, in his analysis of the laboratory-field margins in biology, calls "borders", regions of transition characterised by permeability and overlap rather than discontinuity.[52] Only when the deference of media professionals to scientists was removed, and, thus, authority over the common production arena contested and asserted by media culture, did the 'problem' surface, when the scientific establishment was no longer able to popularise through the mass media to address widespread popular ambivalence with science. I follow Hans Peters in his suggestion that the root of tense of interactions between scientific experts and media professionals is

[49] WS Bainbridge (1976): 145-157. FH Winter (1983): 87-97. FH Winter (1990): 87-94.

[50] EM Daniels (2004): 4, 54-58.

[51] J Agar (1998): xi-xii, xvii, 1, 43-45, 47-48, 90-92, 140-142, 225-230.

[52] RE Kohler (2002): 12-19 in A Jones (2010): 13.

cultural difference.[53] Such an insight tallies nicely with the theoretical notion of a common production arena in which cultural authority over production is contested, and diverse identities and cultures communicate interculturally to create popular scientific representations.

Far less scholarly attention, however, has been paid to the motivations and strategies of media executives and professionals in entering into negotiations with scientists in the production of popular scientific representations. A truly symmetrical analysis requires an exploration and explanation of how and why media actors also sought to extend their cultural authority over the common arena.[54] This symmetrical analysis necessarily includes an investigation of the agendas and approaches of science-mediating specialists to forge social identities in the hypothetical common production arena, as we shall see later. As we have already seen in relation to the BIS and Jodrell Bank, even in studies of popularisation there is scope to explore the media perspective in their facilitating rather than challenging the efforts of scientific experts to assert the dominant concern. Editors, journalists and broadcasters conceded this facilitation because it was in their professional and competitive interests to do so. Various authors have emphasised that that the media context is the most important and the least understood aspect of production of popular science in the media. Sharon Dunwoody notes that the production infrastructure of popular science follows journalistic rather than scientific norms, proven by the fact that media coverage of science looks a lot like coverage of other genres.[55] Miller claims that a proper understanding of science and the media necessitates an approach that pays attention to and "locates the media in the context of wider formations of power and influence and of historical processes" and in the context of its interactions with the scientific community and the public.[56] Though the importance of media context has, thus, been identified, few scholars have explored it and, I suggest, in consequence have underestimated the overarching influence of media culture on the development of science and the media.

Various academics have cited source and evidence limitation for their lack of exploration of the media context in studies of science in the media.[57] Marcel LaFollette, for example, claims that it was difficult to account for the characteristics of the media in which messages about science were displayed.[58] Jeff Hughes, despite overcoming this constraint in his study of the emergence of science news values in interwar Britain, echoes this

[53] HP Peters (1999): 252-254.

[54] Gregory and Miller, *op. cit.*, pp. 105-108.

[55] Dunwoody, *op. cit.*, pp. 17-21.

[56] Miller, *op. cit.*, pp. 206-211, 221, 224.

[57] For example: Bauer and Bucchi, *op. cit.*, pp. 6-8.

[58] MC LaFollette (1990): 18-20, 37-39, 44.

claim. Hughes regrets that it is difficult to find a cache of material that allows access to the inside workings of the fast-moving newsroom and the actual decision-making processes of news creation and management in mass media industries.[59] These practical issues can, however, be circumvented by creative and triangulated use of the personal and institutional archives of scientific and media actors and organisations. Nevertheless, the source base for this thesis is, inevitably, both limited and selective. My archival sources include broadcasting correspondence from the BBC Written Archives Centre, the administrative records of Jodrell Bank and the BIS, editorial files at the *Manchester Guardian*, and the personal communications of specialist science writers such as Ritchie Calder and JG Crowther. Newspaper articles, radio and television programmes and scripts, newsreel and cinema films, museum exhibitions, popular books, and interviews with important media and space science actors provide a selection of further primary material. Such a source base is, of course, neither exhaustive nor representative, but can nevertheless provide a rich, symmetrical and contextual picture of the developments and interactions in the production of mass media popular science. At the least, I suggest my thesis integrates a range of primary material in such a way that stands in opposition to Mike Schafer's argument that studies of the media's coverage of science have been biased towards the biomedical sciences and the print media, if, admittedly, I also focus on a Western country.[60]

A symmetrical analysis of production negotiations necessitates an equal focus on how and why media actors also contested authority over the common arena and the production of popular scientific representations. The motivation for media professionals and executives in extending their cultural authority over the notional arena was so that popular scientific representations could be constructed on their own terms and in support of their outlet's needs, even if their authority was not always enforced. Various authors have noted that popular science was a topic that appealed to print media editors and publishers in the early twentieth century seeking distinctive ways to grab the attention of readers.[61] Broadcasters also sought to exploit public demand for popular scientific material, as increased competition for audiences was the most prevalent feature of the media through the middle part of the twentieth century. Mass media professionals constructed popular science as a specialist industry resource hoping to take advantage of the profile and prestige of science to supply and satisfy the demands of audiences. I employ recent useful work on the political economy of the media such as Gillian Doyle's 2002 studies *Media Ownership* and *Understanding Media Economics* to show how science in the media developed as a product of a competitive media culture. I also build on the scant previous work that has focused on the impact of media technology. Anthony Smith suggests that

[59] J Hughes (2007): 11-13.

[60] MS Schafer (2010): 9-10.

[61] Dunwoody, *op. cit.*, pp. 15-18.

technological innovations in the media open up new ranges of possibilities for the direction in which the production of popular science is performed, but the specific evolutionary paths which are then followed are determined by the interaction between these new technological possibilities and other societal factors – economic, political or cultural – which impinge on the options for change provided by the new technologies.[62] Similarly, I argue that science, and especially space science through developments such as satellite broadcasting, impacted upon the mechanics of the proposed common production arena in terms of revolutionising methods of production and distribution. Such revolutions increased the competition for audiences and placed increased importance on meeting the demands of viewers and listeners with entertainment programming. These developments favoured those who were expert in the skills and techniques of populist broadcasting, thus, providing media professionals with more production agency. Media culture further extended its authority over the arena, though media actors also shaped space science, especially through the programmatic advocacy of broadcasters.

Jane Gregory argues that science communication occupies a space within which different actors may delineate or dissolve territories to serve their own functions.[63] Of particular use in understanding *how* cultural authority in the space I hypothesise as a common production arena was redrawn in favour of media culture is Andrew Abbott's sociological term "reduction". Abbott defined reduction as the process whereby a new activity is assimilated by a professional group to its existing set of activities.[64] The tool by which this assimilation occurred was what Harold Perkin calls contributory or "professional expertise", a variety of property conferring the security to press a class ideal.[65] Tim Boon argues that such professional expertise can be seen as operating also between professional groups.[66] In terms of the arena, media culture asserted and extended its authority because it insisted members of the arena were expert in producing popular scientific copy and programming that would appeal to mass audiences. Technological developments that elevated the importance of media expertise of members of the arena in support of competition for audiences, thus, also aided the extension of the authority of media culture over the arena. The commercial importance of popular scientific representations, ultimately, instigated the overhaul of cultural authority in the common production arena.

That media executives and professionals contested control of what I define as a common production arena shows that science was important to them. Yet, the literature on the British media pays scant attention to the effects of science on the media, appearing rarely

[62] A Smith (1977): 174-179.

[63] J Gregory (2003): 40-41.

[64] AD Abbott (1988): 41 in A Jones (2010): 12.

[65] H Perkin (1989).

[66] T Boon (2008): 185-191.

beyond anecdotes in studies and never as an analytical device. Gregory and Miller (1998) explain this discursive oversight of the impact of science on the media as a product of media studies as a field growing out of studies of political reporting. Consequently, it is only recently that other subjects, science among them, have come to the attention of mass media researchers as a non-special case in the mass media.[67] Similarly to the British space science literature, the historiography on the British media is dominated by political, technological and institutional texts. Bruce Lewenstein, in an essay on 'science and media', encouraged scholars to exploit the possibility of cross-cutting analyses that employ techniques from wider media studies.[68] I add to such work by bringing history into media studies and the media into history so as to define and explore the relationship between space science and the media, especially to focus on how science in the media impacted upon and was impacted by the commercial pressures of media industries. I do so by building on the sociological approaches to the 1977 and 1978 analyses of media culture of Tom Burns and Philip Schlesinger, respectively, in their investigations of BBC broadcasting. In particular, I apply the concept of what Stuart Allan called "news culture" – that news discourse is socially, economically, politically and culturally constructed – to understand the agendas and approaches of media executives and professionals in the production negotiations in the arena.[69] The most obvious manifestation of how science in the media impacted upon and was impacted by the commercial pressures of media industries was the emergence and development of science-mediating specialists. Despite the prevalence of such science-mediating specialists, in the broader British media literature only Jeremy Tunstall, in his 1971 study of specialist correspondents in *Journalists at Work*, mentions science journalism, and then only in passing. Part of the reason for this minimal attention, I suggest, is because of Sharon Dunwoody's observation that science journalists are niche specialists.[70] More detailed analysis has come from scholars of the history of science and science in the media.

I seek to critique the claims of various scholars including John Durant, Gregory and Miller and Peter Bowler, who note how science journalism grew out of the scientific community's self-serving, ambivalent attitude to popularisation, and was subsequently modified by media culture.[71] I feel such superficial analyses, such as that by Sharon Dunwoody, oversimplify developments by claiming that the task of popularising merely passed into the hands of science journalists over the middle part of the century, as scientists came to fear the hazards of engaging with the mass media or as communication with less specialised

[67] Gregory and Miller, *op. cit.*, pp. 105-108.

[68] B Lewenstein (2001): 13654, 13657.

[69] S Allan (1999): 1-6.

[70] Dunwoody, *op. cit.*, pp. 16-21. For examples of the parsimonious contributions of science journalists see to science news: T Wilkie and E Graham (1998): 150-159. J Durant and N Lindsey (1998).

[71] For example: JR Durant (1994): 331-340.

'others' became a low priority.[72] Undoubtedly, certain scientists, as with the BIS, withdrew from the popular sphere, but many experts continued to engage in negotiations in the proposed common production arena, as did journalists who did not identify with the label of science-mediating specialists. The development of science writers, and science broadcasters, was much more a product of seeking to forge a professional identity based on demonstrable expertise in the arena over which the cultural authority was shared, undefined and shifting. In many ways, science writers and broadcasters forged social and professional identities in the arena based around the notion that expertise in intercultural communication was of use in the arena in the production of popular scientific material.

Certain studies have focused more closely on the circumstances surrounding the emergence of science journalism in the print media in the interwar years and the pioneering efforts of JG Crowther and Ritchie Calder in particular.[73] These studies rightly point out that the development of science journalism was complex because the role of the correspondent itself was loosely defined. PD Duncan investigates the presentation of science in four British newspapers by tracing the careers and ideologies of four main actors – Peter Chalmers Mitchell, Calder, AW Haslett and Crowther – while an unpublished essay by Jeff Hughes analyses the political alliance between Crowther and the Cavendish Laboratory in Cambridge.[74] Both these studies emphasise and re-create the social interplay of actors - editors, specialist-mediators and scientists - and their differing motives and approaches to the negotiations as science journalism first emerged in response to public demand for popular science. However, I feel that Duncan ascribes disproportionate agency to the journalists' philosophies in creating the new profession, while Hughes, on the other hand, perhaps overstates the commercial pressures and constraints on newspaper owners and editors to seek distinctive copy. I argue that the emergence of what I define as scientific journalism was contingent on a balance of personal motives of practitioners, often partisan to the scientific community, and the commercial interests of print media editors and publishers in attracting readers.

Such a focus on the impact of media professionals and culture on the development of science journalism overlooks the part that scientists and scientific culture played, even if media culture was the overarching driving force. In the interwar years, when the rules of science writing were being defined, the social authority of science and the tradition of popularisation were significant, and had to be taken into consideration by writers seeking to forge a social and professional identity. Hughes, in his study of the emergence of science news values, shows that the rules of professional science journalism and the institutionalisation of science reporting in interwar Britain were negotiated as they

[72] Dunwoody, *op. cit*.

[73] For example: PJ Bowler (2009): esp. 185-189, 191-214.

[74] PD Duncan (1980). Jeff Hughes (unpublished).

mediated between the scientific community on the one hand and the journalistic profession on the other.[75] Similarly, Jon Franklin suggests that the production of popular science is inseparable from science journalists' social interests, the business concerns of media executives, the ideology of news practice and, ultimately, reader demand; it is an 'info-tainment' commodity.[76] I align with such studies that indicate three-fold influences on science writers and suggest that the notion of the common production arena helps unravel these influences. The science writers emerged at a time when both scientific and media culture traded authority over the arena. To forge a social and professional identity that sought to exploit the gap created by public demand for popular scientific material required practitioners to demonstrate a useful expertise contingent on which culture was dominant in the arena. At this time, expertise in and a commitment to both science and the media was required, resulting in the scientific journalist professional identity.

Embracing Kelly Moore's notion of "boundary spanners", I argue, eases the understanding of the development of science-mediating specialists.[77] Here, I follow the approach of David Kirby in his work on science consultants in Hollywood in which he categorises and describes those actors who take on the identity of a scientific expert in the scientific community and that of a filmmaking expert in the entertainment industry as boundary spanners.[78] The professional authority of a boundary spanner rests upon their managing their own unique social identity as a member of both and with the ability to facilitate and negotiate "intercultural communication" between these groups. Thus, boundary spanners, familiar with the customs of each professional culture, allow these distinct cultures to communicate successfully without the need for either to adapt culturally to the other.[79] Such a concept is unusually adept at describing the emergence and development of science-mediating specialists in the proposed common production arena framework, especially science writers. Embracing the terms "science writers" and "science broadcasters" to encompass varying identities of those middlemen who write and broadcast about science in the media also eases the analytical confusion. Similarly to science film consultants, there was no shared social group when mediating between the scientific and media communities, as science writers and broadcasters liaised between and defend the interests and concerns of the public and science, but were members of neither. Therefore, they had to move fluidly between their social identities by foregrounding one contributory or interactional expertise or another, contingent on conditions in the arena at that particular time, and especially on which culture held

[75] Hughes (2007), *op. cit*.

[76] J Franklin (2007): 150-155.

[77] K Moore (1996): 1596.

[78] DA Kirby (2008a): 43-47.

[79] DA Kirby (2008b): 165-168, 171-179.

production authority.[80] In this way I define two identities: a "scientific journalist" is a scientist who acts as a journalist, whereas a "science journalist" is a journalist who specialises in science.

Scientific journalists, as experts in media and science, were, thus, boundary spanners. Scientific journalists had to negotiate and traverse the common production arena in which media professionals and executives and scientists cooperated yet sought to control the agenda of public science communication. As Dorothy Nelkin remarks, many science journalists still occupy an awkward position between two professions with quite different expectations, demands, constraints and, above all, conceptions of science writing.[81] I suggest that these science journalists found themselves in an awkward position because they often harboured a partisanship to science that is a conflict of interest. However, as Gieryn suggests, it was also in the interest of scientific journalists to maintain or reinforce the boundary between science and the media because it also defines and necessitates their identity and expertise as mediators.[82] Scientific journalists enjoyed the support and endorsement of much of the scientific establishment, and were somewhat entrusted with the task of continuing the tradition of popularisation by proxy. If we borrow Abbott's term "delegation", scientists' endorsement of scientific journalists was a means for scientific culture to retain some authority over the common production arena by delegating this task to sympathetic writers.[83] Yet, as media culture extended its production authority, science writers were required to foreground their expertise in, and commitment to, presenting science in a manner that attracted readers. The construction of science writers as science journalists – that is, journalists who specialised in presenting science to lay readers and who were partisan instead to the business interests of the media – contributed to the 'problem' of science in the media.

There has been little academic scrutiny of the postwar development of science writing because, as Dornan points out, much scholarly discourse has served to indict the culture, interactions and practices involved in the contemporary print media that favours what I term "science journalism" over scientific journalism.[84] Going against this discourse, I question Anders Hansen's assertion that science journalists are first and foremost journalists, suggesting that science writers constructed a unique identity in the constructed common arena based on their expertise in media and science.[85] I suggest that the utility of this identity was always in question and eventually a conflict of interest and

[80] HM Collins and R Evans (2002): esp. 254-260.

[81] Nelkin, *op. cit.*, pp. 8-13, 100-108.

[82] T Gieryn (1983): 781-782, 791-793.

[83] Abbott, *op. cit*.

[84] See: C Dornan (1990).

[85] A Hansen (1994): 111-112, 130-132.

expertise given the authority of media culture over the production arena. The vested interest of science writers in maintaining the legitimacy of science explains why the profession is often described as being obscurely defined.[86] In many ways, it could be argued that mid-twentieth century science writers suffered from the same ambiguity of professional identity that Aileen Fyfe identified for their counterparts in the mid-nineteenth century, due to similar tensions between the conceptions of science writing held by scientists, publishers and the practitioners themselves.[87] It is for this reason, similarly to the lack of professionalisation of public relations practitioners identified by Jacquie L'Etang, that I have not addressed and engaged with more critical and insightful developments in the fields of science studies or media history, especially analyses of journalism.[88] In the period under scrutiny in my study, I argue that individual editors, publishers, producers, writers, broadcasters and scientists, and their individual agendas, were crucial to the chaotic development of science and the media. Because science writers and broadcasters did not enjoy well-defined identities it could be asserted that such professions were not formalised, in comparison to sports- or music-mediating specialists, until more recent times.

More scholarly attention has been paid to the development of what I term science broadcasting, though, as both Gregory and Miller, and Bucchi and Trench in their editors' introduction, point out, the historical relationship between science and the broadcast media is far from complete, especially pre-1980. Mirroring analyses of science journalism, John Durant has suggested that science programming passed from scientists into the hands of professional broadcasters.[89] Jim Bennett claimed that "science on television grew out of the fact that television itself is a technological wonder" and that its presentation of science has been very much a product of the age.[90] Again, these judgments oversimplify matters and are far from a satisfactory explanation of how science broadcasters emerged and developed and of how science and broadcasting have shaped and been shaped by each other. Sophy Le Masurier's Masters dissertation exposed the strained relationship between science and BBC radio in the 1930s. Building on Le Masurier's work, Allan Jones reveals how, like science writers who carved a new reporting niche in the print media, producers at the BBC began to specialise in presenting popular science in programming in the interwar years. I suggest that science broadcasting occupied a different common production arena, with different rules, from that of science writing. These rules placed an emphasis on broadcasting expertise. As a consequence, I argue, science broadcasters had to foreground their media expertise more than science writers. It was this identification of

[86] Dunwoody, *op. cit.*, pp. 16-20.

[87] A Fyfe (2005): 218-221.

[88] J L'Etang (2004): 56, 90-91, 112-113.

[89] Durant, *op. cit.*, pp. 335-344.

[90] J Bennett (1999): 159-162, 172.

science broadcasters as industry specialists that instigated what Jones calls a "clash of expertise" with scientists in their refusal to allow the scientific establishment to delegate their popularisation to them.[91] I submit that it was also a conflict of interest, though the BBC's public service remit favoured science programming and prevented many scientists from constructing a problem with science in the broadcast media. Science broadcasters were boundary spanners, but boundary spanners who foregrounded their media expertise more than their scientific sympathies in accordance with the conditions of authority in their medium's arena.

Yet, in the postwar years, a 'problem' of science in the broadcast media did emerge. Marcel LaFollette, in her study of science broadcasting in the US, offers the useful perspective of viewing the production of science broadcasting as scientists negotiating with gatekeeping producers and owners for valuable access to the air in a powerful cultural industry increasingly shaped by consumerist business entertainment values, especially with the advent of television.[92] In the public-commercial British system, entertaining audiences also became the trade currency, and science broadcasters were aided by exciting postwar developments in science. Robert Dingwall and Meryl Aldridge highlighted the importance of the balance between public service and commercial pressures in their study of the evolution of television wildlife documentaries. Science broadcasters – now either producers specialising in science programming, or broadcast science journalists – had to emphasise their commitment to and expertise in producing output that would attract audiences. As Tim Boon pointed out in *Films of Fact*, BBC Science and Features editor Aubrey Singer's dictum that televising science became "subject to the principles of programme structure and demands of the dramatic", with priority given to the medium, and thus entertainment, rather than scientific pedantry, was an effort by science broadcasters to stress their media expertise and commitment.[93] In many cases, this extended to engaging with the prevailing popular ambivalence with science and questioning the social authority of science that was already prevalent in the print media. The removal of deference of broadcasters, and the marginalisation of partisan science broadcasters in a period in which the 'fashion' for popular science was waning, contributed to the emergence of the 'problem' movement.

I argue that the historical origins of the 'problem' of science and the media and the problematic development of science-mediating specialists as 'boundary spanners' can be revealed by treating popular scientific representations as boundary objects and employing the utility of the common production arena as an analytical concept, as I will detail in the following section outlining the main arguments of my thesis. I show how the conceptual

[91] A Jones (2010): 1-2, 12.

[92] LaFollette, *op. cit.*, pp. 1-5, 7-9, 211-214, 236-246.

[93] Boon, *op. cit.*, pp. 1-2, 231-232.

and methodological framework outlined above aids understandings of how the arena was constructed and how cultures sought to extend their authority over it, and how I build on and contribute to concepts raised in the existing discourse on science and the media. In particular, I highlight my symmetrical analysis of the production of popular science in the mass media that exposes the agendas, perspectives and approaches of scientific, media and specialist-mediating actors that impinged upon development of the science-media interface.

A common production arena: The main hypothesis

In this thesis, I undertake an historical study of the relationship between space science and the mass media from the 1920s to the 1970s. The aim is to contribute to the literature on science and the media that seeks to understand the science-media interface. In particular, I focus on the production of popular representations of space science in the mass media. To understand production sufficiently requires a symmetrical approach that analyses the approaches and agendas of those that interact in production: in this case, scientists, media professionals and executives, and science-mediating specialists. I, therefore, employ archival and primary material from scientific institutions such as the British Interplanetary Society (BIS) and Jodrell Bank radio astronomy observatory, print and broadcast media organisations such as the British Broadcasting Corporation (BBC) and the *Manchester Guardian* newspaper, and individual science writers and broadcasters such as JG Crowther, Ritchie Calder and David Wilson. Dorothy Nelkin argued that to understand the present-day style of science journalism, we must first consider patterns and precedents established many years ago, especially expectations, attitudes and norms that shaped an emerging profession.[94] I argue that the same is true of science and the media. Through this material, then, I reveal how and why these three actor groups interacted historically in the production of popular scientific representations in order to contribute to scholarly discourse regarding the public understanding of science in a modern democratic society. I suggest that media actors gained more *and* had less to lose from exploiting the profile and prestige of science than scientists had from utilising the power and reach of the media.

The analytical tool I employ to undertake this investigation and extract these revelations is space science, the utility of which has already been hinted at in exploring the Beagle 2 PR campaign. Ranging from astronomy, cosmology and astrophysics to space exploration and rocketry, space science can offer insights into the negotiations in the production

[94] Nelkin, *op. cit.*, pp. 85-86.

context that other subjects cannot. First, the esoteric nature of the subject and its limited practical applications presents challenges for its scientific specialists and advocates in terms of justification and promotion. Often, space scientists have had to appeal for popular support through the mass media. In doing so, they were hoping to legitimise their work in order to gather political and financial support. From the perspective of media executives and professional, space science was a popular topic because the discipline was considered newsworthy, entertaining, educational and culturally enriching. In other words, it was a source of prestigious material with which to compete for audiences as part of their business concerns. For science-mediating specialists, space science presented a stream of notable developments with which to form articles and programmes and to demonstrate their expertise such that their professional and social identities would be consolidated. The virtue of space science, then, is that it was valuable to each of the three actor groups and, thus, aids a symmetrical exploration of the interactions at the science-media production interface.

Here, I am building on the suggestion of the information science and communications scholar Jack Meadows, who extolled the virtues of employing space science as a tool for contextualising science communication.[95] Various scholars, including Miller, as seen earlier in his study of the exceptional news coverage of the COBE results, have demonstrated these virtues. For example, Jane Gregory, in her 2005 book *Fred Hoyle's Universe*, extensively explicates Hoyle's controversial role in the ideas, organisation and public face of astronomy in Britain. Richard Holliman used the potential discovery of life on Mars to provide an overview of how a science issue in the media might be studied in terms of production, content and reception of texts. I seek to build on Holliman's argument that the relationship between the production, content and reception of messages is far from linear and that science communication is shaped by power relations, conventions and structural frameworks, and that the relationships between the cultures of science and the media are likely to be as varied and diverse as the number of professionals involved.[96] I utilise space science as an analytical lens with which to explore the cultural interactions between science and the media in the production of popular scientific representations. I am using the broad concept of culture, here, defined by Hans Peters as members of a certain social group that share norms, values, knowledge and conventions.[97]

To explore the complexities of production, I suggest scholars of science and the media test the analytical notion of a common arena in which media executives and professionals, and science-mediating specialists, meet to negotiate the production of popular scientific

[95] J Meadows (2000): 193-197.

[96] Holliman, *op. cit.*, pp. 270-271, 273, 285.

[97] Peters, *op. cit.*, pp. 254-255.

representations.[98] The negotiations entail each actor group seeking cultural or professional authority over production. As we saw above, popular scientific representations were valuable in different ways to each group and this value only increased over the middle part of the twentieth century through developments ranging from interwar cosmological theories to postwar radio astronomy as a nationalistic spectacle of scientific modernity to the drama and politics space age. In this way, popular representations of space science became a form of boundary object over whose production cultural and professional authority was sought. Negotiations in the common arena contested this authority. The contesting of authority over the arena suggests that the conceptions of production of each group, and, thus, their conceptions of the requisite conditions for membership of the arena, differed. Scientists viewed popular representations as a key component of the social authority of science and sought to restrict membership of the arena to those committed to exploiting the media to popularise the legitimacy of science. Media professionals and executives viewed popular scientific representations as a potential niche resource in their competition for audiences and sought to restrict membership of the arena to those expert in presenting science in a way that would attract audiences. Science-mediating specialists sought to construct a new social identity in the arena based on their ability to mediate between and reconcile the conceptions of the production of popular scientific representations of media and scientific culture.

I assert that the notional common production arena came to be dominated by media culture. From the 1920s to the 1970s, media executives and professionals constructed the production of popular scientific representations as being governed by business concerns. I argue that the extension of the cultural authority of the media to include production was caused by developments in media technology and economics. Technological developments revolutionised methods of collection, production and distribution and changed the mechanics of the arena. As a result a plethora of new and cheaper outlets and channels emerged, from the 1920s popular printing press to satellite broadcasting following Sputnik. As a consequence, competition for media audiences intensified and placed an emphasis on news and entertainment in a globalising media culture. Popular material on the latest developments in space science was a potential resource in this competition as public demand for such material increased from the First World War onwards, but especially postwar. Media executives and professionals who controlled access to mass lay audiences restricted qualification of membership of the arena to those who could supply copy and programming that contributed the commercial interests of the media industry. In addition, technological developments, especially in broadcasting, placed significant and increasing

[98] The public, or various audiences, are, of course, a silent fourth actor group in the production arena in that they do not physically occupy a space within the forum but inform the agendas and approaches of scientists, media executives and science-mediating specialists at the science-media interface through their consumption of popular scientific material.

demands on members of the arena to be expert in media techniques and constraints. Qualification for membership of the arena was now also predicated on being able to play to the demands of audiences within the techniques and constraints of the particular media outlet or technology. There were different hypothetical common production arenas for science writing and science broadcasting requiring different skills. As a result of these developments, authority over the production of popular scientific material was co-opted from scientific culture into media culture. This co-option or redrawing of the production authority of the common arena meant that media culture was able to exploit popular scientific representations at the expense of scientific culture. The notion of the arena can explain these developments at the interface and show clearly how science and the media shape and seek to exploit each other. Besides arguing for the potential analytical utility of the common production arena, I suggest that its use reveals two significant supplementary arguments regarding the historical development of science and the media.

Firstly, many scientists identified the 'problem' of science in the media long before the scientific establishment mobilised their concerns into a political movement in the 1970s. The BIS was established at a time, 1933, when the tradition of scientists such as British cosmologists James Jeans and Arthur Eddington generating and disseminating their own popular material to construct an image of science that maintained its ideological and cultural legitimacy and economic favour still held.[99] Founder-president Phillip Cleator exploited this tradition of deference to scientific authority, and the inexperience of journalists and broadcasters with the genre, to form, expand and legitimate the BIS. Yet, even before the Second World War, many members of the BIS Council regretted that the extension of the authority of media culture over the conceptual arena was advancing. BIS Fellows regretted the fact that media executives and professionals began to limit the opportunities for scientific experts to directly address lay audiences in the 1930s. These scientific experts viewed mediated popular scientific representations as a potential threat to the social authority of science.[100] As a result, due to the risks of mediation adverse to their esoteric reputation, the BIS largely ceased the public aspects of their role as an advocacy group. However, this problem of science in the media did not mobilise into a movement because BIS Fellows had overestimated the threat of media culture extending its authority over the arena.

Until well into the postwar years, the common production arena was largely fluid and manipulable, as Pillinger found with Beagle 2, which hints at limitations in the

[99] LaFollette, *op. cit.*, pp. 1-17, noted that US scientists began to pay more attention to, and sought to mould, their public images through popularisation once their political and social power had been strengthened.

[100] I employ the definition of mediation advanced by J Curran et al. (eds.) (1977): 139-141, which states that mediation occurs between those groups or classes that constitute the audience for the media and those whose definitions of social reality are being communicated.

hypothetical model as discussed in the thesis conclusion. Even though media culture was extending its cultural authority, scientific experts continued to enjoy the ability to popularise directly to mass lay audiences. Media executives and professionals undermined their own identities and expertise and deferred much production influence to scientists because of source dependence.[101] The value of popular scientific material in the postwar years was such that it was an invaluable resource in media competition for audiences, even if the advocacy messages and images presented served the interests of science as much as the commercial interests of the media. The supporters of the Jodrell Bank telescope project found that journalists and broadcasters facilitated rather than mediated their efforts to construct a narrative of scientific spectacle around the scheme. Jodrell Bank director Bernard Lovell, a celebrity scientist as a consequence of his position as figurehead of the project, thus found that media executives and professionals were complicit in constructing the narrative that helped raise the telescope to iconic status. The complicit nature of this science-media relationship was a product of aligned interests. These aligned interests meant that negotiations in the arena were largely uncontested. Only when interests diverged did tensions emerge and was the production authority of media culture asserted. Lovell and his fellow project publicists encountered such tensions when the project ran into high-profile financial and political difficulties. Lovell and his allies were motivated to challenge for production authority and to seek to assert the conception of popularisation in the arena because the social legitimacy of the project was threatened. This challenge was manifested in PR and media management strategies that sought to circumvent the mediating function of journalists and broadcasters. Such challenges were resisted and resented by media executives and professionals who asserted their cultural authority and professional identities and expertise and the conception of the production of popular science as an industry resource. Only in this instance did supporters of the Jodrell Bank telescope encounter the problem of science and the media.

Yet, media culture was extending its authority over the proposed common production arena, and was an increasing threat to the social authority of science. This threat was increasing because membership of the arena was increasingly restricted to those who could produce popular science that resonated with the attitudes of audiences. Ultimately, tensions arose because scientists and media professionals differed in their understanding of the arena because of differing personal agendas and the differing conceptions harboured by their respective professional cultures, especially the importance of considering the culture of the audience.[102] The demand for resonance was an issue because of increasing scrutiny and criticisms of the social effects of science and scientific experts, even before the moon landings. This ambivalence manifested in both a shrinking amount of popular science appearing in the media and more frequent active challenges of

[101] A Hansen and R Dickinson (1992): 375-376.

[102] Peters, *op. cit.*, pp. 254-255, 264-266.

the social authority of science in those representations that did occur.[103] The last line of defence for science were the sympathetic science-mediating specialists. The second supplementary argument of the thesis is that the common production arena can aid understandings of the emergence and development of science-mediating specialists.

The same post-First World War public eagerness for popular scientific material that encouraged the extension of media culture over the arena provided the opportunity for science-mediating specialists to forge social identities therein. In the interwar years both scientific and media culture put forth their motives and conceptions – popularisation and industry resource respectively – of the production of popular scientific material. At this time, it was far from clear which culture held authority over the arena and, thus, neither could dictate or restrict membership of the arena according to their preferred demonstrable expertise. Consequently, neither culture had the mandate to implement its own conception and motive in, nor would allow the other's conception and motive to dominate, the arena. This tension provided a gap for science-mediating specialists to forge a professional identity. Both science writers and science broadcasters emerged at this time. I define science writers and broadcasters broadly as those who specialised in mediating science in the print and broadcast media. These broad definitions allow for multiple identities to be defined within. I argue that multiple identities are essential because science broadcasters and writers had to adapt their identities dependent on the prevailing cultural authority over the common production arena. In the interwar years, when the opportunity for specialist mediators to emerge presented itself, science writers and broadcasters developed who were expert in and partisan to both science and the media. These science-mediating specialists also sought to reconcile the respective conceptions and motives of the production of popular scientific copy and programming of the scientific and media cultures. These science writers and broadcasters forged valuable identities in the conceptual arena based on their expertise in intercultural communication and in producing popular scientific material that met the conditions of the arena; they were 'boundary spanners'. Science broadcasters such as Mary Adams had to foreground their media expertise more than science writers such as JG Crowther and Ritchie Calder because of the technical demands and different rules of their particular hypothetical common production arena.

In the postwar years, the extension of the cultural authority of the media over the arenas owing to intense competition for audiences and technological developments meant that science writers and broadcasters had to further foreground their media expertise in producing valuable popular scientific material. Science writers in particular had difficulty in reconciling the identity they had constructed as experts in mediating science – or

[103] Gregory and Miller, *op. cit.*, pp. 117-120.

scientific journalists – with the dominant conception of print media executives and professionals, such as at the *Guardian*, for the production of popular scientific copy that served the commercial interests of the media in attracting audiences as science journalists. The increasing entertainment focus of broadcasting culture, even at the BBC, also meant that science broadcasters – at this point both producers who specialised in science programming, such as James McCloy, and broadcast science journalists, such as David Wilson – had to further foreground their commitment to, and expertise in, attracting audiences with broadcast science. Those specialists that had reservations concerning their responsibility to science, such as Phil Tucker at the *Guardian*, were marginalised at the expense of general writers and broadcasters who moved laterally into the specialist science field. Those that openly subscribed to the notion of science-mediating specialists as industry resources, such as BBC Science and Features editor Aubrey Singer, became subject to the fickleness of industries that responded to public whim and reduced the space allocated to popular science. The incompatibility with the notional arenas, and conflict of interest, of the social identity of 'boundary spanner' writers and broadcasters partisan or sympathetic towards science, signified the final step in the extension of media authority over production. The overarching production dominance of media culture motivated the scientific establishment to mobilise the political 'problem' of science in the media movement. The aim of this movement, heavily endorsed by the Association of British Science Writers (ABSW), was to re-establish the production authority of scientific culture in the common arena and reinstate the possibility of exploiting the media as a conduit of popularisation.

In the next section I sketch out the remainder of the thesis in which I analytically explore the complex interactions in the production of popular scientific material at the science-media interface. I summarise how I seek to employ the virtues of space science as an analytical tool to investigate the science-media interface symmetrically from the perspectives of the three actor groups. I sketch out how the empirical chapters provide evidence to support my claim for the utility of the notion of a common production arena and the idea of popular scientific representations as a boundary object over whose production cultural authority is contested. In particular, I suggest that the arena, though having its limitations, can provide fruitful insights into the development of science-mediating specialists and the 'problem' of science and the media. I finally note how I conclude the thesis by suggesting how my thesis can contribute to scholarly discourse on science and the media and debates surrounding a scientific citizenry in a modern democratic society.

Thesis Outline

The remainder of the thesis is set out thematically and chronologically in order to trace the major developments in the production of mass media popular space science in the twentieth century and the major influences that guided these developments. The analytical notion of the common production arena is applied in order to test its capacity to aid understanding of the interactions at the science-media interface. Within this arena, the agendas and approaches of scientists, mass media executives and professionals, and science-mediating specialists are investigated symmetrically. In the following empirical chapters it becomes clear that, for diverse motives, all three actors groups perceived authority over or identity within, what I define as, the common production arena as desirable because of the value of popular scientific material as a boundary object. It also becomes clear, problematically for my framework, that the negotiations and relationships within the arena were largely fluid, with the 'problem' of science in the media only being constructed into a movement when the arena was contested *and* the social authority of science was questioned. The common production arena is, however, a useful concept for explaining the emergence and development of science writers and broadcasters and the problems they encountered in seeking to forge professional identities as 'boundary spanners' with dual expertise. In conclusion, I suggest the common production arena is a useful tool for scholars of science and the media in helping to understand how and why science and the media shape and seek to exploit each other, but is not capable of characterising all the complexities of the historical narrative.

The structure of the thesis is book-ended by two institutional case studies that focus on the motivations of and attitudes towards engaging with the media of scientists and the scientific establishment. In the first of these case studies, Chapter Two, I follow the promotional activities of the BIS as a space advocacy group. Fellows on the Council understood that publicity was vital to building both the legitimacy and influence of the BIS and to encouraging support for and progress towards their goals of spaceflight and interplanetary travel. However, even in the interwar years various Council members identified a 'problem' with the media in that the tradition of deferring to scientific experts direct access to mass lay audiences by media executives and professionals was being challenged. BIS Fellows were concerned that mediated rather than popularised popular representations of their esoteric activities could adversely impact upon their legitimacy. Council members had viewed engaging with the media as a benign tool. Now, Fellows developed an embedded institutional distrust of such engagements based on their perception that the authority of media culture over the common production arena was incontestable. As a consequence, the BIS had a minimal popular profile and a marginal influence over developments in space science. The following three chapters approach the arena from the perspective of media executives and professionals and science-mediating

specialists. These chapters reveal that the arena was a much more complex and often fluid place than BIS Fellows perceived and that the popularisation tradition of scientists generating and disseminating popular scientific representations was far from incompatible with conditions in the arena under the authority of media culture.

In Chapter Three, I follow and explain the development of science writers in the print media. 'Science writer' is a broad term that helps differentiate between the professional identities and expertise that practitioners displayed. In the interwar years, editors and publishers wanted to supply the increased public demand for popular scientific material as a strategy in their intensifying competition for readers. Print media executives and proprietors wanted to supply this copy on their own terms rather than relying on scientist-popularisers for contributions. This was the beginning of the extension of the authority of media culture over the common production arena that the BIS Council identified as a problem. At this time, science writers emerged who saw the increased editorial and publisher demand for popular scientific copy as an opportunity to forge a new social and professional identity in the arena as specialist mediators. Partly because of personal motivations and partly because of the problem of source dependence in science writing, these science writers sought to demonstrate as much commitment to and expertise in science as the print media. The likes of JG Crowther and Ritchie Calder had forged an identity as boundary spanners or scientific journalists who were subject to and sought to bridge and maintain the borders of both the media and scientific cultures. However, editors and publishers, who controlled access to media platforms and readers, favoured the conception of science writers as science journalists and restricted membership of the arena to those who displayed this identity and expertise. Journalists who were expert in reporting on and presenting science for lay readers were especially valuable in the space age. There was, thus, a conflict of interests and a conceptual clash between print media executives and proprietors and science writers. The marginalisation of sympathetic scientific journalists such as Phil Tucker unless they accepted the notion of acting as a niche industry resource and foregrounded their print media expertise was the final step in consolidating the authority of media culture over the arena. This consolidation was the catalyst for the scientific establishment to form the underlying 'problem' of science in the media into a movement with the ABSW at its heart.

Chapter Four provides a contrast and a comparison in its tracing and analysis of the development of science broadcasting at the BBC. In the interwar years, with scientific experts delivering talks and broadcasters recognising the potential value of science programming to attract interested audiences, the development of science broadcasting looked set to mirror the development of science writing. Indeed, it even seemed as if science-mediating specialists were going to forge a similar professional identity as the science writers in the print media. However, there was one significant difference that

meant that the development of science writing and the development of science broadcasting were dissimilar: the mechanics and rules of the common production arena were different in broadcasting. The audio and visual nature and technology of the medium placed heavy emphasis on broadcasting technique. Science broadcasting was, thus, subject to the constraints and changes in broadcasting culture. Only professional broadcasters had the requisite expertise. As a result, media culture extended its authority over the arena and the development of science broadcasting was largely subject to negotiations within this culture. Similarly to the print media, scientists were no longer afforded unmediated access to mass lay audiences though this was not construed by the scientific establishment as a significant 'problem' because it was in the interests of broadcasters to promote science and because broadcasters tended to defer much production influence to experts in order to retain their programmatic cooperation. As with science writers much later, science broadcasters developed as specialist industry resources, though with scientific sympathies. Producers like Mary Adams and James McCloy specialising in science programming emerged – first in radio, then in television – whose identity in the common production arena was more contingent on their expertise in producing such programming that would entertain, educate, and inform listeners and viewers, than expertise in science. With commercial radio then commercial television impacting upon the BBC's public service broadcasting monopoly, the authority of these science broadcasters was reinforced by their ability and capacity to produce programming that would attract audiences without attracting hierarchical or scientific community criticism for pandering to populism.

In Chapter Five, I explore how the relationship between science and broadcasting was made more complex and intimate following the orbit of the Sputnik satellite in October 1957. The development of rudimentary satellite broadcasting motivated many British broadcasters to assume an industry future dominated by intense global competition for audiences. With the BBC already suffering a ratings crisis, numerous producers and managers sought to technically and administratively position the organisation as best placed to create and reach new audiences in the 'inevitable' global broadcasting era. The perception of increasing competition for audiences drove a more populist culture in British broadcasting. These developments encouraged the advance of media culture over the common production arena and elevated the importance of broadcasting expertise in terms of obtaining or retaining membership of the arena. Science was among the most newsworthy subjects of the space age. Science programming and broadcast science journalism was, thus, a valuable entertainment resource in the schedules. Accordingly, science broadcasters – now a term defining both producers specialising in science and broadcast science journalists – found their professional identity in the common production arena reinforced because of their expertise in producing programming that allowed a public service broadcaster to compete for audiences in an increasingly commercial

marketplace. The aggressive demands of broadcasting industry and culture was both a source of opportunity and challenge for science broadcasters given their vow to the BBC Science Consultative Group to produce programming that was as responsible to science as it was interesting to audiences. The requirement that sympathetic science broadcasters foreground their commitment to acting as industry specialists, with more potential to fuel popular ambivalence with science, or else be marginalised, also motivated the scientific establishment to consolidate the 'problem' of science in the media into a political movement. In the meantime, rather than influencing negotiations within the production arena, satellite technology affected the mechanics of the medium and, thus, the arena itself. By revolutionising methods of production and distribution, space communications offered another means for media culture to exploit science. However, ultimately, the cost of satellite broadcasting was prohibitive, with British broadcasters becoming consumers and secondary suppliers of satellite broadcasts, or customers of US satellite infrastructure, rather than occupying a pioneering presence. Eventually, even science programming could not address the BBC's ratings slide.

In Chapter Six, I apply what we have learned about the agendas and approaches of media executives and professionals and science-mediating specialists in the common production arena to the second institutional case study of scientists seeking to engage with the media. The Jodrell Bank radio astronomy observatory telescope project was proposed at a time when media culture had already established a large measure of authority over the arena. Yet, the supporters and promoters of the project did not have an inherent distrust of engaging with the media, as did the BIS Council. Jodrell Bank Director Bernard Lovell and his fellow telescope publicists understood that the production authority of media executives and professionals was not immutable and could be manipulated. The newsworthiness of the spectacular project meant that writers and broadcasters would defer much production influence and especially allow Lovell, as a celebrity scientist, to address mass audiences relatively unmediated. In this way media executives and professionals undermined their professional identities and expertise and were complicit in constructing a narrative of national scientific modernity surrounding the telescope that ensured its foundation, preservation and future as an icon. Only during the high profile political and financial problems of the project – when the social authority of science was questioned – did Lovell and his allies identify a 'problem' of science in the media. In these instances, when the interests of media actors and scientific experts diverged, the arena was contested rather than fluid and the production authority of media culture asserted. Attempts to set the news agenda through PR and media management techniques were resisted and rejected by media executives and professionals committed to the conception of science news as a specialist industry resource to attract audiences, rather than as scientific popularisation. Though Jodrell Bank's status was secure, eventually the scientific

community's lack of ability to popularise was manifested in the 'problem', in that the spreading lack of popular and political appreciation of science could not be countered.

In the thesis conclusion, I draw together all the strands from the empirical chapters to re-engage with and discuss the conceptual framework and arguments outlined in this introduction. I will argue that the evidence justifies my claim, suggested by the Beagle 2 episode, that a common production arena is a useful conceptual tool for identifying and explaining occasions when science and the media shape and seek to exploit each other using popular scientific material in the mass media as a boundary object. The arena can symmetrically identify the agendas and approaches of scientists, media professionals and science-mediating specialists in negotiating the science-media interface over which even media culture mostly held authority. I will show how the 'problem' of science in the media is an historical phenomenon that surfaced when media professionals challenged the tradition of popularisation, but which was only mobilised once the deference to the social authority of science and, thus, experts' production influence was finally removed. I will suggest that the identification of science writers and broadcasters as 'boundary spanners' was problematic, and that demands for practitioners to foreground their expertise as niche media specialists committed to the audience contributed to the 'problem'. In many ways, including in terms of technology influencing the mechanics of the arena, the media had much to gain from extending their cultural authority over the common production arena. However, I will add that my analysis demonstrates that both those studying and active participants in science and the media should appreciate that production context is largely fluid and uncontested, with its authority and negotiations subject to change, for example with the development of social media. As a consequence, the limitations of the theoretical and methodological model are reflected upon. I end by pointing out the potential for future development of such symmetrical historical studies of encounters and developments at the science-media interface.

Chapter Two

"Afraid of making space interesting": The reluctant advocacy of the British Interplanetary Society

Phillip Ellerby Cleator formed the British Interplanetary Society (BIS) in Liverpool in October 1933 with the aim of encouraging "the conquest of space and thence interplanetary travel".[1] Today, the Society claims to be the "world's longest established organisation devoted solely to supporting and promoting the exploration of space and astronautics".[2] These mission statements identify the BIS as an advocacy group dedicated to fostering the development of spaceflight. Yet, throughout its existence, Fellows on the BIS Council have focused more on supporting the academic and industrial infrastructure of space science than on promoting its more esoteric aspects. In the process, the BIS and its members helped institutionalise the discipline of space science.[3]

Yet, in the first half of the 1990s the Council's neglect of promotion was challenged by a significant section of the membership. Nicholas Booth and Frank Miles, both on the science staff at the Independent Television Network (ITN), accused Fellows, such as Mark Hempsell, of being "afraid of making space interesting to the lay person".[4] This fear, Booth and Miles believed, was rooted in a disdain for, and, thus, reluctance to engage with, the mass media. Most grievously, Miles and Booth suggested that this aversion to mass media promotion was impacting upon the ability of the BIS to act as an advocacy group, including in a supporting capacity for the field. At a time when there was a widespread lack of political and popular interest in space activities, Miles and Booth argued that the Council's attitude meant that the BIS had a marginal capacity to influence the development of spaceflight.

In this chapter I look historically at the activities and goals of the BIS to identify the origins of the Council's cautious advocacy policy. This policy can be traced to Fellows' perennial institutional tension between gathering popular support and securing their legitimacy as scientific and engineering specialists. This tension manifested itself in terms of the balance of importance apportioned to the functions of supporting versus promoting the development of interplanetary travel. Two related factors tipped the balance in favour

[1] PE Cleator (1934): *JBIS*, spring: 2-5.

[2] BIS (2011).

[3] For more see: J Allen (2008), AM Barry (1987), and Sir H Massey and MO Robins (1986).

[4] *BIS Archive* Box Spin-Off 1: letter to Hempsell from Booth 9 June 1995; letter from Miles to Chris Welch 23 June 1995; correspondence between Booth and Hempsell 3 July 1995 and reply. See also: M Hempsell (2008).

of active support for space scientists and engineers at the expense of promotion. Firstly, an overarching concern with the technical reputation of the BIS; secondly, the perception that Council members were unable to influence the mediated popular representations of the BIS and its activities constructed by mass media professionals.

This perception, I argue, is an early expression of the 'problem' of science in the media as perceived by many in the scientific community. Like most scientists and scientific institutions, BIS Council members were concerned at their increasing inability to directly address audiences with their preferred images and messages. This concern manifested itself in terms of inhibiting the promotional policy of the BIS. Interactions with mass media professionals were deemed hazardous and a source of potential harm to the reputation of the BIS, and were largely avoided. This defensive response was based on a simplistic and misguided view of the production of popular scientific material, one that largely overlooked the fluidity in the common arena despite the extending authority of media culture over the arena. Certain Fellows, such as Cleator, understood this fluidity and sought to use it to the advantage of disparate British space enthusiasts. With the help of deferential or allied journalists, editors and publishers he exploited the media to found, expand and consolidate the BIS.

"An appreciation and a plea": Early interactions between the BIS and the media

In the 1920s and 1930s space science, a field that had until recently consisted merely of astronomy, was expanding to include cosmology, rocketry, upper atmospheric and ionospheric studies, and cosmic ray and interplanetary research.[5] In early August 1933, Phillip Cleator saw an article by an American Professor of Mathematics regarding the possibility of a rocket flight to the moon in the *Liverpool Echo*.[6] With expanding activities and increasingly forward-thinking pronouncements in the rocketry field, Cleator assumed that "some competent scientist, or group of scientists, would form a British society sooner or later". When no action towards forming such a society was forthcoming, Cleator resolved to form a British space enthusiast group that would encourage the development of interplanetary travel.[7]

[5] Sir H Massey and MO Robins (1986): xix, 1, 9.

[6] FH Winter (1983): 87-97.

[7] P Cleator (1936): 142-158.

Writing in 1936, Cleator remembered being convinced that "somewhere in England there must exist a number of isolated enthusiasts", outcasts of conventional thought like himself.[8] This is an important claim, for it suggests that Cleator believed that a number of contingent factors were in place that contributed to a critical mass of potential members. Popular and technical space science writers, including Jules Verne and HG Wells, and news from overseas advocacy societies and pioneers, had influenced Cleator, like many rocketry and space advocates. Not having a society in the UK, Cleator joined the American Interplanetary Society (AIS, later the American Rocketry Society or ARS) in 1931.[9] Popular interest in space science had also been stimulated by significant media coverage of the 1919 eclipse expeditions of the British astronomer Arthur Eddington to confirm Einstein's relativity theory, the 1920s rocketry theories and experiments of Konstantin Tsiolkovsky, Robert Goddard and Hermann Oberth, and news from associated interest groups in America, Russia, Austria and Germany, as well as the balloon voyages of 'stratonauts' such as the Swiss Piccard brothers Jean and Auguste.[10] In addition, eminent British astronomers published a number of popular books, such as the 1930 *The Mysterious Universe* by James Jeans. The fictional space voyages imagined in popular science fiction films such as Fritz Lang's 1929 movie *Frau im Mond* also generated excitement for space travel in Europe.

Cleator's judgment that the early-to-mid-1930s was a period of opportunity to form a space enthusiast society was echoed elsewhere. In 1932, both the Society of Engineers and Darwin Lyon, a US physicist and meteorologist working in Davos, had noted the considerable popular and academic interest in rocketry and a potential future space-faring society.[11] With the potential for a viable society established in terms of a latent membership, in August 1933 Cleator was faced with the hurdle of how to reach and connect with the isolated enthusiasts.[12] Here, I argue, Cleator identified that the mass media provided a platform for bringing these isolated enthusiasts together. This identification was partly because Cleator's own enthusiasm for space travel was a product of coverage in various media. It was also partly because the nature of media industries was changing, with the popular press, in particular, expanding and diversifying in competition for mass audiences. Cleator himself had recognised and taken advantage of the demand of print media editors and publishers for distinctive copy writing a series of non-technical expositions on 'The Possibilities of Interplanetary Travel' for *Chambers's Journal* from 1931 to 1933.[13]

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[8] P Cleator (1936), *op. cit*.

[9] FH Winter (1983): 87-97. D Kilgore (2003): 31-32, 47-48.

[10] For example: *The Manchester Guardian* 8 June 1931, p. 9; *The Times* 13 Jan 1920 p. 11, col. B.

[11] *JRUL SC MGA* ECAS: Lyon to Scott 9 Mar 1931. *The Manchester Guardian* 19 Jan 1931, p. 10, 6 Apr 1931, p. 7, 3 May 1932, p. 9.

[12] P Cleator (1936), *op. cit*.

[13] PE Cleator (1934): *JBIS*, spring**:** 2-5.

However, this series of articles was an exception, and a product of Cleator's previous demonstration of his writing skill to the editors at *Chambers's*. Despite his best efforts, Cleator found it difficult to access and exploit media platforms to form a critical mass of space enthusiasts. Part of the problem, he felt, was the "undisguised suspicion" of editors towards copy on space science.[14] Suspicion is perhaps an overstatement, but it is true that popular scientific material was only beginning to regularly feature in newspaper columns in this period, with many editors even less likely to sanction esoteric and non-news articles. Though many editors and publishers had recognised the potential value of science journalism as a distinctive resource with which to compete for readers, few science writers had the requisite expertise to maximise this potential, as we shall see in chapter three. Cleator, I argue, recognised this opportunity to exploit certain editors' and journalists' eagerness for popular scientific material and the absence of a defined science writer professional identity. Having seen the rocketry article in his local newspaper by the American professor, Cleator identified the editor of the *Liverpool Echo* as a potential "far-sighted" ally. Following a brief correspondence, Cleator met with an *Echo* reporter in his home laboratory, and an article appeared on August 8 appealing for members of a proposed space society.[15]

However, this article attracted little attention, gathering only one response from an interested reader. The prospective members of a space enthusiast group were too scattered for this regional exposure to succeed. The limited exposure was disheartening, but Moore Raymond, a special correspondent for the *Daily Express*, had spotted Cleator's appeal in the *Echo*.[16] Cleator met with Raymond, and believed his interest in space travel was "unmistakeably genuine", and, thus, a journalist who would treat the idea of a space enthusiast society seriously.[17] Cleator's trust paid off as Raymond persuaded his editor to spread notice of Cleator's intention to form a space society across half the front page of 20 August 1933 of the *Express*. This national exposure was the trigger for the formation of the BIS. Cleator received numerous inquiries from readers eager to become members and the first official meeting of the BIS was convened at his home in early October 1933. By December the BIS had twelve members and as it grew its presence and work became generally newsworthy.[18] In the spring of 1934, for example, the *Manchester Guardian* reported on the Society's successful foundation, consolidation and expansion.[19]

[14] PE Cleator (1934): *JBIS*, spring: 2-5.

[15] *Ibid*.

[16] PE Cleator (1934): *JBIS*, summer: 16-19.

[17] P Cleator (1936), *op. cit*.

[18] PE Cleator (1934): *JBIS*, spring: 2-5.

[19] *The Manchester Guardian* 21 Apr 1934, p. 12.

Cleator's interactions with Raymond set the tone for the early interactions between the BIS and the media. Cleator and BIS Council Fellows were frequently allowed to directly appeal to mass audiences for support by deferent editors or sympathetic journalists eager to capitalise on audience interest and demand for popular space science copy and Cleator's expository talent. In the Cleator-Raymond alliance, in exchange for exclusive material and information on the Society for his newspaper columns and popular books, such as regarding the idea of a rocket car, Raymond continued to promote the activities of the fledgling BIS.[20] Such alliances undermined the professional mediating identity and expertise of journalists and editors and allowed BIS experts to extend the tradition of scientists' influence over production into the mass print channels. Cleator acknowledged in the *Journal*[21] that the BIS owed its existence to "vital publicity without which the BIS would surely have remained a mere dream". Cleator also hinted that his alliances had enabled him to gain more publicity for his proposals and activities than they likely deserved or merited.[22] Exploiting the dependence and deference of the media in this way was, thus, crucial to the foundation and early growth of the BIS. However, the early growth of the BIS, and the role that mass media promotion played in its consolidation, were not without their problems.

In 1934, as President, Cleator visited the overseas counterparts of the BIS, including the Verein für Raumschiffahrt (VfR) (or German Society for Space Travel), to seek their advice on how best to move forward as a space advocacy group. He returned with a clear plan in mind. Firstly, Council members were to concentrate on gathering popular support and attracting new members. They were to do so by continuing to promote the BIS in all channels and sectors Fellows could obtain access to, ranging from the interested specialist community to the majority of the general public who had "evinced not the slightest interest" in space science. In the process of building a strong membership the financial position of the BIS would be strengthened with the ultimate aim of embarking on an experimental programme. This programme was intended to secure the technical support and reputation of the BIS.[23] However, this plan to consolidate the BIS encountered several stumbling blocks.

It quickly became clear that the membership ranks, though expanding, were not swelling as rapidly as had been hoped. Nevertheless, a small experimental fund was implemented, but legal and geographical constraints on explosives testing meant that propulsion projects

[20] PE Cleator (1934): *JBIS*, spring: 2-5. PE Cleator (1934): *JBIS*, summer: 16-19

[21] It must be noted here that the *Journal* (full title, *The Journal of the British Interplanetary Society*) is a form of official history, and as such does not treat actors and institutions symmetrically, but can play a part in reconstructing the Society's early publicity efforts and their motives alongside other sources.

[22] PE Cleator (1934): *JBIS*, spring: 2-5. PE Cleator (1934): *JBIS*, summer: 13–15.

[23] PE Cleator (1934): *JBIS*, summer: 13–15.

were not feasible. In addition, institutional hindrances such as the charitable status of the BIS and its lack of Royal Charter impacted upon the prestige of its limited work on rocketry technology.[24] The most pressing issue in the development of the BIS was, then, a lack of financial resources, with typical annual income of less than one hundred pounds.[25] Cleator tried to obtain outside support for the BIS, including from the Air Ministry and Under Secretary of State.[26] The BIS Council also made efforts at international collaboration with overseas space societies, but these only resulted in the exchange of theoretical literature.[27] With financial problems of most significance Fellows sought to consolidate the membership base of the BIS.

The first concern was to retain the interest, support and subscriptions of the existing membership. Chastened by the experiences of the VfR and its problems with its journal *Die Rakete*, whose temporary non-publication was identified as the cause of a significant contraction in membership, Cleator believed that the publication of a Society periodical was vital to avoid the "stagnation" of the BIS and he financed the first edition personally.[28] From early 1934, the Council supported the publication of a quarterly *Journal* containing technical papers, adverts and notices for members, and generally reporting the business of the BIS. Cleator and science fiction writer pioneer-members Ted Carnell, Bill Temple and Arthur C Clarke were among its early editors and contributors.[29] However, as with the BIS it served, the *Journal* struggled financially, though a firm of publishers was eventually identified that meant its publication and distribution was more reliable.[30]

In order to for the BIS to grow, new recruits were needed. Cleator and publicity-minded Fellows sought to advertise and generate news coverage about the BIS in a variety of technical and popular publications.[31] Advertisements were exchanged with allied technical publications such as *Practical Mechanics*. Similarly in the popular press, advertising space was swapped with the juvenile story-paper *Scoops*.[32] AM Low, the inventor whose 'Professorship' caused much consternation among his scientific contemporaries because he did not occupy an academic chair, recruited following Cleator's Germany trip, promoted the BIS in his popular *Armchair Science* journal, opening its columns to articles on rocketry

[24] *Ibid*.

[25] N McAleer (1992): 31-42.

[26] D Edgerton (2005): A scientific-technological elite in the civil service dominated the interwar technocratic military-industrial complex, but they seemed to pay little attention to the BIS or the civil and military potential of rocketry.

[27] PE Cleator (1934): *JBIS*, summer: 13–15.

[28] *Ibid*. *JBIS* May 1935.

[29] A Sawyer (2008): esp. 122-123. N McAleer (1992): 31-42. M Goldsmith (1986): 59-64. The Science Fiction Association even shared a base with the BIS.

[30] P Cleator (1936), *op. cit*.

[31] PE Cleator (1934): *JBIS*, summer: 16-19.

[32] *BIS Archive* PC File 6: Oct 1934.

and notices on its meetings and talks from May 1934 onwards.[33] Clarke and other professional writers among the Council produced BIS brochures while Cleator exploited Fellows' science fiction connections to contribute a survey of the space exploration field to the magazine *Thrilling Wonder Stories* of August 1936. However, generating news coverage of the BIS was less straightforward.

Cleator was able to secure the attention of the local press for a series of lectures he delivered in the Birkenhead area, but this was a rare exception in this period.[34] Though retaining their media alliances, Fellows did not retain their influence over the production of popular messages regarding the BIS, and, thus, relatively direct access to mass audiences with selected images, because their theoretical activities were not overly newsworthy. Cleator recognised, from previous experience, that promoting the BIS in the mass media, and in the still-predominant newspaper media in particular, was contingent on actively offering their editorial and journalistic allies valuable material. Cleator felt that material contained in the first editions of the *Journal* could act as a form of press release if distributed widely among print media writers and proprietors. His hope was that this approach would generate widespread notice of the BIS and its work and "make England interplanetary minded", and, in the process, attract numerous new subscribers.[35]

Cleator judged the campaign to have been a success, generating extensive exposure of the BIS. The evidence supports his claim as the *Guardian* devoted half an editorial column to the contents of the *Journal*, and the *Radio Times* of 27 April 1934 carried a small article on the imminent promise of spaceships, as a direct result of this promotion. However, other Council members had reservations regarding the potential risks of uncontrollable interpretations in such active engagement with the media. These Fellows' stance was justified following a major blow to the reputation of the BIS when such press coverage prompted the influential Sir James Jeans to write an article in *Scoops* dismissing space travel. Having previous contact with the editor, Cleator managed to publish a series of eight defensive articles in response, and, soon, contributed a weekly news feature on space exploration, but irreparable damage had been judged to have been done to the image of the BIS by many Fellows.[36] Subsequent Council discussions, retold in the *Journal* by Cleator, reveal that divisions were beginning to appear between Fellows regarding the policy of promoting the BIS.

Cleator rejected criticisms of his active campaign arguing that the press release strategy had elicited mostly beneficial and accurate descriptions and comments in the media and

[33] For example: August 1934 and March 1935.

[34] For example: *The Wallasey News* 16 March 1935.

[35] PE Cleator (1934): *JBIS*, spring: 2-5. *JBIS* May 1935.

[36] PE Cleator (1934): *JBIS*, summer: 16-19.

that it had actually created an editorial and journalistic demand for articles on rocketry, a demand he was eager to supply.[37] Above all, he argued that print media professionals had largely facilitated his efforts to bring the BIS and its activities and goals to the notice of a wide readership, and had resulted in a large number of new members. It was his conviction that in the media, generally, the BIS had "a staunch and interested supporter", and he hoped that print media professionals would continue to positively assist Fellows' efforts to build popular interest and support.[38] Others on the Council, though, were becoming acutely concerned with what they termed "journalistic licence", whereby the representations of the BIS were becoming increasingly varied, and the nature of the Society's activities were often masked by a story's colourful writing. Sensationalism, such as with contemporary press accounts of Mars being annexed to the British Empire, was a concern, but largely accepted as an inevitable interpretation given the esoteric nature of the activities and goals of the BIS.[39] Exaggeration and fabrication, however, such as with an account given in the *Sunday Referee* of November 1933 which gave the impression that a manned rocket shot had already taken place in Germany, was condemned. Fellows appealed for media reports that were consistent with current progress in the field even if the real facts appeared "undoubtedly prosaic" to certain journalists.[40] It is clear that a schism was emerging among the Council with regard to the potential benefits and drawbacks of promoting the BIS through the mass media.

Those focused on the potential drawbacks were preoccupied with the legitimacy of the BIS. The main concern of this faction was to secure respect for the BIS in the technical community, even at the expense of consolidating the membership and finances. Their issue with the mass media promotion of space travel and spaceflight was the fact that editors and journalists increasingly asserted their professional mediating identity in constructing popular representations of the BIS and its work. In such mediation, and based on previous experiences, the faction perceived the potential for interpretations and depictions that could negatively impact upon the specialist reputation of the BIS. They were not averse to promoting the BIS in principle; rather, they were concerned at the fact that editors, publishers and journalists were no longer dependent on scientific experts in such a way that offered scientists production influence. Print media professionals, thus, now largely prevented scientists from directly addressing and appealing to audiences on their own terms. It was this decreasing influence over the production of popular representations of the BIS that was identified as the problem with actively engaging with the media.

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[37] PE Cleator (1934): *JBIS*, spring: 2-5. *JBIS* May 1935.

[38] PE Cleator (1934): *JBIS*, summer: 20.

[39] A prophetic precursor of rhetoric that would be mobilised in postwar policy debates, see: CN Hill (2001).

[40] PE Cleator (1934): *JBIS*, summer: 20.

Consequently, more emphasis was placed on promoting the BIS, if at all, in those media channels in which Fellows retained significant production influence. Publishers still afforded expert writers extensive editorial oversight and the popular book market was an attractive option for the Council. Following and inspired by the efforts of David Lasser, the Chairman of the AIS, and his 1931 book *The Conquest of Space*, and the first major British exposition on spaceflight and space travel *Stratosphere and Rocket Flight* by Charles G Philp in 1935, Cleator published *Rockets Through Space: The Dawn of Interplanetary Travel* in 1936. Cleator's aim, like his fellow authors, was to advertise and justify the field of astronautics, to appeal for popular support and membership expansion, and to seek technical respect and legitimacy.[41] To achieve these aims, Cleator took inspiration from the "forthright opinions and superb prose style" of the philosopher Bertrand Russell to engage with diverse audiences, though the book's potential influence may have been reduced by the introduction from the infamous Low.[42]

Yet, of concern to those Fellows preoccupied with the reputation of the BIS was that even this more traditional popularisation approach had the potential to generate unexpected and potentially damaging popular representations in the mass media. The emerging science writers JG Crowther and Ritchie Calder both reviewed the book in their columns, but even the sympathies of these professional popularisers could not be relied upon, as seen in the following chapter. Calder questioned the scientific effort dedicated to such an esoteric goal, given the acute social problems of the 1930s, while Crowther's article linked Cleator's book to the contemporaneous release of W Curzon Menzies and Alexander Korda's 1936 film of HG Wells' space fiction *Things to Come*.[43] In the *Journal* of early 1937, Cleator welcomed the publicity generated, arguing that occasional critical coverage was acceptable in exchange for any opportunity to advocate and arouse interest in interplanetary travel to mass audiences. But anxiety remained among the concerned Council faction that the respectability of the BIS could suffer from such interpretations, especially being associated with the inaccuracies portrayed in the film, notably the 'space gun'.[44]

The BIS Council was in institutional conflict. Implicit was a tension of how best to increase the influence and impact of the BIS and, thus, to encourage the development of interplanetary travel. There was a division between those, including Cleator, who believed that popular support was more important, and for whom promotion was the solution, and those who believed that securing specialist legitimacy was crucial, and for whom providing technical support to the field was the answer. The latter group of Fellows was in the

[41] P Cleator (1936), *op. cit.*, introduction, pp. 15-20, 159-227.

[42] EM Daniels (2004): 9, 11.

[43] *The Manchester Guardian* 13 Mar 1936, p. 7. *NLS MC RCA* Acc. 10318/36: *Daily Herald* 25 Feb 1936.

[44] *JBIS* Feb 1937. PE Cleator (1937): *JBIS*, Feb 1937**:** 13, 18-19.

ascendancy, a group who had an intrinsic distrust of the mediating mandate of print media professionals. Despite the origins of the BIS being rooted in promotion, and its ongoing crippling financial and membership base, the future policy of the BIS was to be determined by this group's perception that engaging with the mass media could jeopardise their specialist legitimacy.

Outcomes that cannot be determined a priori: The BIS and its fear of mediation

In 1936 and 1937 a faction among the Council surfaced that challenged Cleator's dominance and his focus on promoting the BIS. Headed by Ralph Smith, a section of Fellows who were preoccupied with the engineering reputation of the BIS challenged for control of the direction and function of the BIS. In particular, Smith and his allies were concerned that, though the Society was popularly seen as a group of forward-looking rocket engineers, the BIS remained on the margins of respectable discourse. The faction blamed Cleator's 'dumbed-down' promotional style for their isolation, believing that mass media representations increasingly portrayed the BIS as scientifically inept futurists.[45] Smith's rival section favoured supporting, rather than promoting, the development of interplanetary travel, and believed that becoming part of the scientific and technological mainstream was vital for the BIS to able to act as a crucial forum in the field.

Smith convened a series of meetings in London to which Cleator and his fellow Liverpool members were not invited, and exploited administrative tensions between the concurrent branches to appeal to members, through the *Journal*, that the BIS required a centralised headquarters in the nation's capital if it was to be taken more seriously.[46] The first meeting at the new London base was at Low's office on 27 October 1936, and the constitution signed on 7 February 1937. Cleator did not agree with the changes and resigned as BIS President and as chief Editor of the *Journal*, and no longer contributed articles. He was, however, concerned about the BIS, so he served on as Vice-President for a while and gave his full official support to the new Council under Smith's presidency.[47] The move away from Liverpool and Cleator's leadership signalled a new era, and the

[45] *JBIS* June 1936: 16; *JBIS* Feb 1937**:** 4.

[46] N McAleer (1992): 31-42. FH Winter (1983): 87-97. EM Daniels (2004): 62-68. The headquarters alternated around Fellows' homes.

[47] *JBIS*, June 1936**:** 16, 32. PE Cleator (1937): *JBIS***:** 13, 18-19. *JBIS* Feb 1937**:** 3, 4. RA Smith (1937): *JBIS*, July**:** 5-15.

constitution agreed by the new hierarchy in the BIS was preoccupied with its specialist legitimacy.

In opening the proceedings of the first meeting, Low revealed the new focus for Smith's Council. He emphasised that constructing a reputation for the BIS that would command interest in the scientific world and the respect of the lay public was of utmost importance.[48] Consequently, the majority of Fellows' time and effort was targeted towards demonstrating and consolidating the theoretical, and limited experimental, expertise of the BIS. Ultimately, they hoped, this would allow the BIS to play a crucial supporting role in encouraging the development of spaceflight. Under the new Council, promotion, and thus consolidating the membership and finances, became of secondary importance. Yet, a Publicity Office was instigated and Ted Carnell, founder editor of *New Worlds* magazine, was initially appointed Director of Publicity. His remit was to edit the *JBIS* and to publicise matters from the Technical or Experimental Committee that met regularly under J Happian Edwards. In this way, as Smith expressed in the *Journal*, the Council hoped that any popular representations of the BIS that appeared in the media would necessarily emphasise the legitimacy of their activities. The Council's hope was that by *constraining* access to and the information released about the BIS they would regain some measure of production influence by *constraining* the potential interpretations that could ensue. In particular, their hope was to minimise the potential for journalistic licence.[49] The media sensation that followed the rogue and inadvertently high profile activities of a sister space enthusiast group supported the Council's stance.

As Cleator was being removed as President, the Manchester Interplanetary Society (MIS) attracted the widespread attention of the media with a rocket competition accident. The MIS, allied with the Manchester Astronomical Society (MAS), was started and led by sixteen-year old Eric Burgess, who would go on to prominence as a science journalist. The group was made up of sixteen teenage members determined to circumvent the legal ban on explosives experimentation. They used their pocket money to follow in the footsteps of overseas pioneers such as Goddard in building and testing rockets. Like the national BIS, engaging with the media had been advantageous in terms of recruitment for the MIS. The branch had already received some national publicity, appealing for members in the press following Wells' film, with the *Reynolds Illustrated News*, *Manchester Guardian* and *Daily Mail* profiling the Society and their interplanetary goals in November 1936.[50] Following Cleator's example, Burgess was active in utilising the media to promote, establish and legitimise their group and activities. He appreciated the necessity of publishing a Society

[48] *JBIS*, Feb 1937: 13, 18-19.

[49] RA Smith (1937): *JBIS*, July: 5-15.

[50] *Reynolds Illustrated News* 29 Nov 1936, *The Manchester Guardian* 25 Nov 1936, p. 13, *Daily Mail* 4 Feb 1937. *JBIS* Feb 1937: 4-5.

journal, giving public lectures and exploiting media allies, as with one member's journalist father at the local *Ashton Under Lyne Reporter*, to gain regular coverage of the MIS.[51]

In many ways the MIS was very similar to the BIS, but its committee did not fear the media. Burgess and his fellow MIS members were convinced that the best way to gain both recruits *and* legitimacy was through promoting their experimental activities. Unfortunately for them, a plain-clothes policeman stopped their rocket contest of 27 March 1937 after one projectile exploded causing various injuries among the crowd. Writing in 1998, Harry Turner, a teenage member of the interwar MIS and editor of its journal *The Astronaut*, recalled the incident. Besides being initially newsworthy as the only time an amateur society had launched rockets from English soil, the contest provided a "shock-horror" picture story for the media. The story broke in a stop-press column in the *Manchester Evening News* on the day it occurred, before the *Sunday Express*, *News of the World* and *Sunday Chronicle* took it up the following day. The incident was still national news on the Monday and Tuesday in the *Daily Mail*, *Daily Herald*, *Daily Express* and *Manchester Guardian*. Later that week the local newsreel theatres included brief footage of the incident.[52]

Consistent with their lack of concern with engaging with the media, MIS members, like Cleator before, attempted to turn this negative publicity to their advantage, exploiting press interest in the ensuing court case to try to encourage journalists to portray positive popular representations of their space activities. The MIS received support from the *Daily Express*, which provided the group with a free barrister and reported that Burgess "dazzled the court with science".[53] Afterward, Burgess and Turner were pleased that, despite the accident, they had raised the profile of rocketry and believed that media coverage had generally rationalised a future form of propulsion.[54] However, the BIS Council did not share their positivity over the incident, not least because the court judgment further reduced the ability of space enthusiasts to conduct explosives and rocketry experiments.

Of more pressing concern to BIS Fellows was the impact of the interpretations of media professionals of the accident on their reputation for conducting serious scientific work. For example, a mocking *Guardian* report on the "capers" of the group made rocketry seem like a juvenile prank rather than an academic field.[55] According to Turner, BIS Fellows were glad that the episode had made space research an everyday topic of conversation,

[51] Winter, *op. cit.*, pp. 92-94.

[52] H Turner (1998).

[53] Daniels, *op. cit.*, pp. 58-62.

[54] Turner, *op. cit*.

[55] *The Manchester Guardian 29* Mar 1937, p. 12.

but were keener to distance themselves from the events.[56] Indeed, the BIS *Bulletin* (a temporary, cheaper version of the *Journal*) of the 29 July 1937 reassured members that there was no connection between the two Societies, though the MIS formally joined the ranks of the BIS in 1938. The MIS incident made the BIS Council even more acutely aware of the potential damage to their reputation for scientific legitimacy of their lack of influence over how their popular representations were mediated. However, Fellows also knew that a certain amount of promotion was necessary to retain popular interest in the BIS and to continue to build a solid membership and financial foundation. The ideal strategy for the Council was to promote the BIS in such a way that journalistic licence was minimised so that their technical reputation was secured in order that their supporting role in the development of space travel was maximised.

To constrain the possible popular representations of the BIS, the Council resolved to focus resources on rigorous design studies that could potentially be promoted. Even the publication of the *Journal* for late 1937 and all of 1938 was shelved so that all effort could be concentrated on demonstrating that the BIS could provide a tangible output.[57] One of these outputs was a feasibility project for a manned round trip to the moon by the 1950s. The flagship theoretical output of the scientific and engineering design team for the BIS was a spaceship that became known as *Daedalus*.[58] *Daedalus* was fleshed out in the *Bulletin* and the *Journal* from December 1937 to July 1939. Once the Committee was satisfied with the project's scientific credentials among space experts, the decision was taken to promote it more widely as a symbol of the Society's technical legitimacy. Some of its novel instruments, like the coleostat[59], made a brief public appearance at a Science Museum demonstration in the summer of 1938.[60] An outline of the spaceship, as profiled in *JBIS* by Ross, was sent by the Publicity Department with covering letters to all famous persons who had ever shown an interest in the BIS and space exploration, as well as to well-known scientists, numerous journals, magazines, and newspapers.[61]

The *Daedalus* campaign was an attempt by the BIS Council at employing public relations (PR) methods. This PR attempt was constructed around the release of selected information

[56] Turner, *op. cit*.

[57] Smith (1937), *op. cit*.

[58] R Smith and B Parkinson (1979): 'The British Interplanetary Society'.
There is no evidence for this but one assumes that this name was chosen as both a nod to the skilled artisan and craftsman in Greek mythology and Haldane's 1924 use of the same myth to critique the revolutionary nature of modern science. The BIS were perhaps also inspired by Crowther's essay on aviation in Sir Daniel Hall's *The Frustration of Science* (1935) where he asked why Haldane's lecture was inspired by biochemistry and not any other branch of science.

[59] A device for navigating optically in space.

[60] FH Winter (1983): 87-97. EM Daniels (2004): 69.

[61] 'Editorial', (1939): *JBIS*, July: 3-4. HE Ross (1939): *JBIS*, Jan: 4-9.

concerning the BIS and its work. This selective information, Fellows hoped, would ensure only preferred popular representations would ensue. In this approach, the Council was seeking to regain some measure of production influence by undermining the authority and expertise of mediating professionals, especially in the press. This strategy can be viewed as an attempt by Fellows to assure that their interests were represented with maximum media appeal and that a favourable public image of the BIS was constructed.[62] It was an attempt to set the agenda of the news media in order to boost and reinforce the legitimacy of the BIS and its activities. In other words, the Council was seeking to 'sell' the BIS as a crucial node in the space science field and the encouragement of the development of spaceflight.

The selected *Daedalus* material released was of interest to print media editors, publishers and writers. The story was picked up in both the popular and technical presses. *Illustrated London News*, *Time* and *Newnes Practical Mechanics* profiled the project, while national and provincial newspapers including the *Times*, *Daily Express*, *Daily Herald* and *Evening Standard* reviewed the journal and their reporters interviewed Council members.[63] The Society was described on the BBC North station in late February 1939, with one BIS Fellow answering follow-up correspondence in *The Listener* until April. The spaceship plans made the cover of *Nature*, were displayed on numerous bookstalls and "stole half the photo-news page of a national Sunday newspaper from Hitler", with press cuttings collected from around the globe.[64] The majority of the Council proclaimed themselves pleased with the representations of the BIS resulting from the PR campaign. Most Fellows were particularly satisfied by the fair and open-minded articles in technical journals, believing that most of their critics had been "tamed or converted", even if a small proportion continued to question why such an, admittedly, esoteric and distant goal ought to be pursued.[65]

Yet, certain Council members were concerned at the fact that even their attempts to set the media agenda could not be relied upon to serve their interests. Certain Fellows regretted the sporadic "garbled accounts" in the popular press that resulted in popular representations that exaggerated and emphasised the sensational aspects and ignored the competence of the work of the BIS.[66] The Council even suggested that such garbled accounts might have contributed to the influential expert criticism of the BIS and its work from the likes of electrical engineer Sir Ambrose Fleming. In the *Daily Telegraph* Fleming expressed his doubts about space exploration, prompting the Council into a

[62] D Nelkin (1987): 8-13.

[63] *Illustrated News London* and *Newnes Practical Mechanics* both 19 March 1939. *Daily Herald* 17 July 1939 and *Evening Standard* July 1939.

[64] *JBIS*, July 1939: 3-4. HE Ross (1939): *JBIS*, Jan: 4-9.

[65] 'Editorial', (1939): *JBIS*, July: 3-4.

[66] *Ibid*.

correspondence column exchange in May 1939. Fellows were experiencing what Massimiano Bucchi describes as the surprise of scientists who find that the outcomes of communicating at the public level cannot be determined a priori.[67] This perceived lack of control over popular scientific representations of the BIS was an early manifestation of the 'problem' of science in the media. In this construction of the problem, print media professionals were viewed as claiming authority over the production of popular scientific images and messages. In the process editors, publishers and journalists were denying scientific experts the ability to directly address mass popular audiences. Because print media professionals were asserting their mediating identities and expertise, the Council discouraged attempts by PR-minded Fellows to capitalise on the interest aroused by the *Daedalus* campaign. Low wrote an article urging the Air Ministry to collaborate with the BIS in the *Liverpool Echo*, and Clarke wrote a couple of articles for *The Electrician*, but the Council did not support such efforts.[68]

The faction that ousted Cleator was preoccupied with the BIS playing a central supporting role in the development of interplanetary spaceflight and, thus, the technical legitimacy of the BIS. Problematic promotional experiences meant that the Fellows that now dominated the Council developed a distrust of engaging with the media. The faction soon realised that even PR, or more accurately, media management techniques, were not sufficient to prevent potentially unwanted popular representations of the BIS from surfacing that could impact upon its specialist reputation. The mediating function of media professionals could not be undermined or circumvented. Further Council discussion of the balance between and advantages and drawbacks of promotion and support were disrupted by the disbanding of the BIS for the duration of the war, agreed at an extraordinary general meeting and announced in the July 1939 *Bulletin*.[69] Ironically given its distrust of the media, the disbanding met with dismay and support for the BIS from press commentators. Though the *Manchester Evening News*, *News Chronicle* and *Liverpool Daily Post* of 26 October 1939 confirmed the disbanding it was the *Manchester Guardian* that captured the mood of the media at the loss of a potential valuable and newsworthy copy source.[70] The *Guardian* used the desire to reach for the stars to parody the fickleness of war, and lamented that there would be "no more bright news paragraphs about plans for rocketeering to the moon", for audiences in the days ahead.[71] Despite this further positive coverage, the postwar policy of the BIS as an advocacy group was dominated by the Council's wariness of promotion. Because of this, the BIS could only play a marginal supporting role in the development of space travel.

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[67] M Bucchi (1998): 11-14.

[68] *BIS Archive* PC File 13: *Liverpool Echo* 1 May 1939, *The Electrician* 21 July and 4 Aug 1939.

[69] Winter, *op. cit.*, p. 97.

[70] *BIS Archive* PC File 13: Both 23 Oct1939.

[71] *The Manchester Guardian* 23 Oct 1939, p. 4.

The BIS in the rocketry age: Popularisation disguised as PR

From 1939 to 1944 there was no national space enthusiast society. Many former BIS members had been either recruited or diverted from their professional positions to the war effort. Burgess and Clarke had both served in the RAF, for example, as a technical instructor and on the radar project respectively. Where pools of space enthusiasts were concentrated, small formal groups persisted or emerged.[72] The Manchester Astronautical Association, formed by Burgess as a splinter group that defied the ban on experimentation, remained active, and Ken Gatland, a design-engineer for Hawker Aircraft Company (later Hawker-Siddeley), formed the Astronautical Development Society (ADS) in Surbiton, with other branches founded in Birmingham, London, Farnborough and Eccles.[73] From early 1944, news began to filter through of the development and deployment of V-2 rockets. Both the work of former and prospective BIS members in wartime commissions and the demonstration of practical rocketry legitimised the space enthusiasts as forward-thinking engineers in a way that had not been possible in the interwar years.

In 1944, sensing this new-found legitimacy, Burgess and Gatland, with help from Clarke and Cleator, merged the small isolated groups to become the Combined British Astronautical Societies (CBAS). Similarly to the focus of the BIS previously, the CBAS sought to encourage astronautical research and its application to the conquest of space.[74] The CBAS, along with Les Shepherd, Len Carter and Val Cleaver, Chief Project Engineer for De Havilland Aircraft Company, made plans to resurrect the BIS when the war ended. In June 1945, an emergency ten-member committee met to discuss how to re-form the BIS. The following September, at a joint meeting, the interests and assets of the CBAS were transferred, bestowing upon the BIS the responsibility and authority of being the principle institution for the community of space enthusiasts. The BIS was re-incorporated on New Year's Eve 1945, with the formerly rogue Burgess as the first chairman.[75] Over the next few years, the BIS Council brought the majority of the remaining small isolated groups under its influence and set about restoring their links with their international counterpart societies. Such was the popular reassessment of the legitimacy of the BIS, now, that recruitment was notably boosted with hundreds of new young professional engineer, technician and scientist members [76]

[72] FH Winter (1983): 87-97. D Kilgore (2003): 111-149.

[73] Daniels, *op. cit.*, pp. 77-84.

[74] Combined British Astronautical Societies (1945).

[75] *JBIS*, 1946**:** 25-30. *BIS Archive* CM Box 79C 1: late 1945 meeting; CM Box 79C 2: Undated report from LJ Carter 'British Rocket Society'.

[76] *BIS Archive* CM Box 79C 1: late 1945 meeting. *JBIS* Dec 1947 and Dec 1953.

With practical rocketry now a reality, the interplanetary and spaceflight goals of the BIS seemed more tangible. This reality also meant that the function of the BIS had to change. Rather than broadly encouraging the development of interplanetary travel, the Council resolved to focus on encouraging the development of rocketry and its application to the field of spaceflight. Fellows determined to exploit the popular postwar space enthusiasm and the elevated respectability of space enthusiasts to position the BIS as an influential promotional, facilitating and coordinating body in the rocketry and spaceflight field.[77] In practice, however, and continuing the pre-war policy of the BIS, the Council's majority focus was directed towards facilitating and coordinating. Promotion was marginalised at the expense of constructing the BIS as a crucial supporting node for specialists and enthusiasts in the space science community. To construct this influential supporting function for the BIS, in 1946 the Council reintroduced the office of Technical (or Research) Director, held by Les Shepherd, a Cavendish nuclear physicist. Though experimentation remained unrealistic for the BIS, the remit of Shepherd and his Committee was clear: to produce and act as a conduit for progress in the field.[78] This strategy, Fellows hoped, would cement the reputation of the BIS as being at, what *Practical Mechanics* called, the "forefront of scientific institutions".[79] Commensurate with the official policy and constitution of the BIS, the Council also instigated a Publicity Office in 1946. Dr AE Slater was elected as first Publicity Director, and was succeeded variously by Clarke, Cleaver and Carter.[80]

However, the role of the Publicity Office was never formally defined. Part of its role was to manage the increased media interest in the work of the BIS. For instance, just as the dissolution of the BIS had been newsworthy, its re-formation had also grabbed media attention.[81] Another focus was to address the concern among Fellows that the V-2 bombs landing in London had instilled an image of rocketry as belonging to the realm of weaponry and fear in the popular psyche. The hope among the Council was to re-orient popular representations of space research around the spirit of adventure.[82] To achieve this re-orientation, various members sought to rhetorically ground and domesticate the astronautical revolution. Arthur C Clarke was a prime example.[83] Clarke, who had gained some popular attention for his communications satellite idea, devoted his career to the explanation and promotion of the spaceflight movement and its implications. When Chairman in the late 1940s and early 1950s, he championed the peaceful goals of the BIS,

[77] AE Slater (1946): *JBIS*: 1.

[78] R Smith and B Parkinson (1979): 'Towards Infinity'. EM Daniels (2004): 77-84.

[79] *BIS Archive* CM Box 79C 1: 7 Nov 1953, 5 Dec 1953, 3 Nov 1956, 13 July 1957, 17 Aug 1957; PC File 13: *Practical Mechanics* Apr 1946.

[80] *BIS Archive* CM Box 79C 1: 16 Feb 1946, 7 Jan 1950.

[81] *BIS Archive* PC File 13: *Practical Mechanics* Feb 1946 and *Daily Mirror* 29 Apr 1946.

[82] Slater (1946), *op. cit*.

[83] See, for example: P Dickens and JS Ormrod (2007) and A Geppert (2007): 585-599.

and recruited dozens of members through promotional literature.[84] Cleaver, Gatland, Carter, Slater and Patrick Moore supported Clarke's efforts both in the print media and in the expanding and increasingly powerful broadcast medium. Broadcasting was particularly fruitful for these PR-minded Fellows, as a conjunction of interests with science broadcasters afforded them significant production influence, as we shall see in chapter four. Though programmes such as *Travel through Space* (1950) were primarily for entertainment, the public-service educational and informational mandate of the BBC offered a chance for Fellows to further legitimise the BIS.[85]

However, the main remit of the Publicity Office was to promote the notion of the BIS as an influential and useful supporter of the development of spaceflight, rather than promoting the development of spaceflight itself. In this way, the pre-war strategy preoccupied with protecting and reinforcing the technical reputation of the BIS was restored. In practice, the principal responsibility of those in the Publicity Office was to promote the activities of the Research and Technical Committee.[86] The target audience for the Publicity Office, accordingly, was its existing membership and peers and prospective members in the scientific and engineering communities. Publicity Fellows, thus, edited the *JBIS* and the *Bulletin*, as well as coordinating the exchange of publications and adverts with allied publications such as *Discovery* magazine.[87] They published commercial BIS books, collected papers and monographs, advertised prestigious guest speakers such as the space science administrator Harrie Massey in their lecture series, and screened various rocketry films, such as *Destination Moon* (1950), at the Science Museum.[88] The Publicity Office also worked with industrial and engineering partners to publicise joint technical and industrial exhibitions, symposia and conferences such as with the British Astronomical Association and the College of Aeronautics. They also sought to exploit high-profile events, securing BIS contributions to the 1949 Earl's Court air travel exhibition and the 1951 Festival of Britain.[89]

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[84] *BIS Archive* CM Box 79C 1: 4 Jan 1947. BIS archive, PC File 13: *Fortnightly Review* Mar 1950: PC File 6: *Popular Science* Apr 1952 p. 164, *Melbourne Age* 8 Mar 1952, *Illustrated London News* 12 July 1952 p.21, *New York Times* 22 June 1952, *Manchester Evening Chronicle* 21 Sept 1953, *Daily Record* 21 Oct 1953, Clarke lecture at Radar Association at UCL, 1954.

[85] For example: *The Times* 5 Oct 1953. *BBC WAC* SFC: A: 18 Jan 1950.

[86] *BIS Archive* CM Box 79C 1: 16 Mar 1946, 22 June 1946, 2 Nov 1946, 16 Aug 1947, *JBIS* Dec 1947, 26 June 1948, 13 Nov 1948, 11 Mar 1949, 7 Oct 1950, 7 Apr 1951, 6 Oct 1951, 1 Dec 1951, 5 Jan 1952, 12 Sept 1953, 6 Nov 1954, 5 Jan 1955, 7 Jan 1956, 15 June 1957.

[87] *Ibid*.

[88] *BIS Archive* CM Box 79C 1: 1 Feb 1947, 17 Jan 1948, 14 Feb 1948, 1 Apr 1950, 8 July 1950, 7 Apr 1951, 30 June 1951, 8 Nov 1952, 6 Mar 1954, 2 Oct 1954, 4 June 1955, 12 Nov 1955, 3 Dec 1955, 7 Jan 1956, 3 Mar 1956, 13 July 1957. *The Times* 8 Oct 1956.

[89] *BIS Archive* CM Box 79C 1: 16 Mar 1946, 17 Jan 1948, 17 Sept 1949, 8 July 1950, *JBIS* Dec 1947, 3 Nov 1956, 13 July 1957, 17 Aug 1957.

Despite the opportunity to exploit the popular interest in space science and the activities of the BIS to promote the development of spaceflight, the Publicity Office was instructed by the Council to avoid engaging with the media if possible. Partly this instruction was because gathering popular support was not the principal focus of the Council. The main reason for this avoidance strategy was that Fellows remained acutely concerned at the potential impact to the reputation of the BIS of mediated popular representations.[90] In reality, most popular interpretations and depictions of the BIS and its work were favourable, with members being portrayed as forward-thinking rocket engineers, scientists and philosophers - the backroom boys of the nation's flagship aerospace industry.[91] Yet it was the rare unfavourable and derogatory popular representations of the BIS that the Council chose to focus upon, representations that they feared could associate them with the fantasy or 'crank' tag. On occasion, this focus extended to challenging what they perceived as unfounded or libellous misrepresentations of the BIS. In general, the Council chose to limit the remit and activity of the Publicity Office and its publicity-minded Fellows such as Clarke.[92]

The Council's caution with respect to promotion was largely because they believed that engaging with the media had more potential drawbacks than advantages. Cautious Fellows, preoccupied with preserving the legitimacy of the BIS, were perturbed at the fact that they had little influence over how they were portrayed publicly. The Council realised that media professionals had authority over the production of these popular portrayals and that mediation and interpretation was unavoidable. Chances to appeal directly to lay audiences were now at a premium. Furthermore, media professionals in various industries and channels were increasingly pressured to provide material that would attract mass audiences. This emphasis on trivial entertainment was especially seen in press coverage.[93] Recent BIS Fellow Mark Hempsell felt this emphasis explained and justified the Council's overwhelming wariness of engaging with the media.[94]

To counter the production authority of media professionals and address lay audiences on their own terms, the Council sought to emulate the growing PR trend in postwar British culture.[95] By managing access to information regarding the BIS, Council members were

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[90] *Op. cit.*, fn 87.

[91] *BIS Archive* PC File 13: *Sunday Pictorial* 10 Oct 1945, p. 5, *Evening Standard* 9 Aug 1949, *Edinburgh Evening Dispatch* 10 Aug 1949, *Nottingham Evening Post* 22 Aug 1949; PC File 6: *Leicester Mail* 21 Nov 1953.

[92] *BIS Archive* CM Box 79C 1: 16 Feb 1946, 1 Feb 1947, 12 Apr 1947, 15 Jan 1949, 14 May 1949, 8 July 1950, 1 Dec 1951, 7 Nov 1953, 5 Dec 1953, 14 May 1955, 3 Nov 1956, 13 July 1957, 17 Aug 1957.

[93] *BIS Archive* PC File 1: *Bolton Evening News* 15 Aug 1951, *Newnes Practical Mechanics* Nov 1951, *Aircraft* Dec 1951, *Natal Mercury* 29 Jan 1952, *Sky and Telescope* Feb 1952, pp.83-84; PC File 13: *Cape Argus* (SA) 14 June 1949. *The Times* 5 Oct 1953 and 24 Feb 1955, p. 4, col. E.

[94] M Hempsell (2008).

[95] J L'Etang (2004): 56, 90, 114-116, 143.

hoping to create a source-driven, rather than media-led, reportage of their work.[96] However, this media management strategy differed from that of the interwar *Daedalus* press release approach. This time, Fellows were hoping to set the media science news agenda by offering selected but newsworthy material that would appeal to writers and broadcasters in the increasingly pressurised mass media culture. Ken Gatland was appointed Press Relations Officer at the beginning of 1948. At first he was just slated to deal with press inquiries, but his remit did extend to include releasing advance notices of lectures, meeting news and theoretical advances. This was a more active strategy, exploiting the deadline pressures faced by media professionals in competing for audiences as the means to regain some measure of production influence over popular representations of the BIS. The Council judged the appointment to be a success, and Gatland's tenure did result in a more visible and positive media presence for the BIS.[97]

However, there was a discrepancy between what the Council and what media professionals deemed to be of general newsworthiness. Fellows believed that their technical activities were of common interest but media writers and broadcasters did not share this judgment. As a consequence, only occasions such as when the annual International Astronautical Congress (IAC) was held in London in 1951 provided extensive interactions between media actors and BIS Fellows.[98] In such instances, the newsworthiness of the Congress combined with the media management strategies – offering press invitations, convening conferences, compiling factual releases, and providing broadcasting facilities – meant that media professionals afforded Council members much production influence.[99] With Congress lectures largely regurgitated verbatim by journalists and broadcasters, this PR strategy was largely effective in setting the media agenda. In the process of constraining the popular representations that appeared in the media, the BIS and its astronautical goals were both promoted and legitimised.[100] Yet, by focusing only on promoting their technical activities, the Council's active PR strategy of targeting the media's weakness was undermined, and resulted in attempts to impose popularisation on professionals who had long since challenged its practice.

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[96] MW Bauer and J Gregory (2007): 33-34.

[97] *BIS Archive* CM Box 79C 1: 17 Jan 1948, 20 Mar 1948, 10 Nov 1951, 8 Nov 1952, 14 May 1955, 5 June 1955; PC File 13: *The Aeroplane* 2 Sept 1949 and 30 Dec 1949, *Flight* 15 and 22 Dec 1949, *Practical Mechanics* 30 Nov 1951; PC File 6: for example a BIS map of the far, unseen side of the moon was picked up by the *Yorkshire Evening Post* 20 Jan 1953 and the *New York Herald Tribune* 21 Jan 1953.

[98] The IAC was the annual meeting of the International Astronautical Federation (IAF) of which the BIS had been a founder member in 1949.

[99] *BIS Archive* CM Box 79C 1: 5 Oct 1946, 18 June 1949, 13 Aug 1949, 7 Jan 1950, 4 Feb 1950, 1 Apr 1950, 26 Aug 1950, 7 Oct 1950, 2 Dec 1950, 7 Apr 1951, 6 Oct 1951, 2 Feb 1952, 23 Aug 1952, 8 Nov 1952, 11 Apr 1953, 2 May 1953, 12 Dec 1953, 5 Feb 1955, 4 Feb 1956, 2 June 1956. *JBIS* Dec 1946 and Dec 1947. *The Times* 10 Sept 1951, p. 2, col. C.

[100] *BIS Archive* PC File 6: *Daily Mail* 6 Sept 1952; *Bristol Evening World* 17 Sept 1953, *Nature* 20 Sept 1952, *London Star* 21-23 Sept 1953.

In general, media professionals, especially press journalists, resented experts undermining their expertise and identity. When the material Fellows sought to promote was not newsworthy, the production authority of media culture was asserted, except, on occasion, by sympathetic and deferential science writers such Ronald Bedford, on his rise to the *Mirror* science editorship.[101] The Council did not appreciate that their strategy suffered because they did not exploit popular demand for scientific material that meant that media professionals could defer some measure of production authority to scientists. Instead, Fellows focused on the fact that even their attempts to play to the demands and constraints of the media could not prevent unwelcome representations, again, especially, in newspapers, even though their attempts in practice were very different to those in theory. In the case of the IAC, for example, the tabloid *Daily Mirror* interpreted a lecture by Clarke suggesting he had his 'passport ready for the Moon'.[102] Broadcasting, for a time, remained a more amenable medium for the Council, with broadcasters dependent on, and deferent to, scientific experts as sources and contributors, and allowing them access to the microphone and screen relatively unmediated, as seen in chapters four and five. Gatland was science advisor on the 1953 fictional radio series *Journey Into Space*, and the BIS gained a producers' acknowledgement for its cooperation on the 1955 film *The Quatermass Experiment*, for example.[103] However, in broadcasting, too, scientists were largely marginalised from production influence as producers asserted their professional science-mediating identities and expertise.

Fellows' lack of production influence even when the BIS was of distinct interest to print and broadcast media professionals made the Council even more wary of engaging with the media. Their main concern was that they could not prevent mediators presenting potential popular representations that could impact negatively upon the respected reputation of the BIS and jeopardise the development of spaceflight. This concern was exacerbated by a sense among the Council that media culture was increasingly oriented around "sensational" interpretations and depictions.[104] Consequently, Fellows withdrew from public advocacy and engaging with the media for a time. The Council's full attention and effort was focused, instead, on the supporting role that the BIS could play in bringing about the space age. With spaceflight widely perceived as being imminent, this focus was particularly targeted at national space policy. Fellows' resolved to encourage governments to allow Britain to play a decisive role in the conquest of space alongside the Cold War superpowers.[105] From time to time, members worked formally with the Ministries of Education and Supply, and the BIS Council was a minor party to the Royal Society Gassiot

[101] *BIS Archive* PC File 6: *Daily Mirror* 27 Nov 1951.

[102] *Ibid*.

[103] IMDB (2011).

[104] *BIS Archive* CM Box 79C 1: 7 Nov 1953, 5 Dec 1953.

[105] Smith and Parkinson, *op. cit*.

Committee that coordinated the nation's International Geophysical Year (IGY) contribution.[106] On the whole, though, the BIS was largely unable to interest politicians in its work or attract influential support for its policy opinions.[107]

As revealed in committee minutes and an article in the *Journal*, this political marginalisation and inability of the BIS to influence the development of spaceflight was of concern to Fellows.[108] In addition, the field of astronautics was under pressure from other space science disciplines such as astronomy in political competition for limited funding. The Council were much concerned, therefore, when the influential Hoyle and Woolley publicly advocated for resources to be directed towards astronomy over astronautics.[109] The Council recognised that their American counterparts, the ARS, had played an important role in the spaceflight movement in the US, with the field occupying a central place in national culture and policy. Cleaver, now Chief Engineer at Rolls Royce, was dispatched on a scouting mission to seek the secrets of the success of the ARS.[110] Fellows recognised that enjoying a respected reputation as credible space specialists and, in the process, playing a supporting role to those in the field was not sufficient for the BIS to have a significant influence over encouraging advances towards their goals in the space age. Now, the Council realised, promoting the development of spaceflight, and, thus, building solid popular support and membership, was as important as legitimacy in terms of improving the influence of the BIS.

To build this support and membership, the Council resolved to exploit the prevailing popular enthusiasm with space to actively champion interplanetary travel. Similarly to the promotional efforts of Cleator and Clarke in the 1930s and 1940s that saw them reined in or ousted, Fellows aimed to appeal to more diverse audiences in more dynamic ways. This strategy, they hoped, would both encourage the development of spaceflight and position the BIS as a crucial component of this development. However, in practice, this proposed approach was not actively pursued. The Council remained overwhelmingly wary of the potential pitfalls of engaging with the media. Fellows wanted a significant production influence that was not achievable given the authority of media culture and professional identity and expertise of media professionals. The Council's true promotional strategy, based on the desire to champion selected representations of interplanetary travel to lay audiences directly, was embodied in the founding of a Popularisation Committee under

[106] *JBIS* Dec 1947. *BIS Archive* CM Box 79C 1: 23 Aug 1952, 27 June 1953, 14 May 1955, 3 Nov 1956.

[107] Combined British Astronautical Societies (1945). F Spufford (2003): 3-6. D Kilgore (2003): 111-149.

[108] *BIS Archive* CM Box 79C 1: 10 July 1954, 4 Feb 1956, 21 Apr 1956. RA Smith (1956): *Spaceflight*: 2-3.

[109] F Hoyle (1997): 251. *The Times* 3 Jan 1956, p. 3, col. F.

[110] *BIS Archive* CM Box 79C 1: 6 Oct 1956, 4 Jan 1958, 3 May 1958, 19 July 1958, 6 Dec 1958; PC File 10: *The Aeroplane* 24 Oct 1958.

Gatland, rather than a Publicity or PR Committee.[111] Gatland and his committee largely concentrated on the familiar strategy of seeking to disseminate the technical publications of the BIS to wider audiences. *Realities of Space Travel* (1957), for example, edited by Carter, contained twenty-four collected papers from the *Journal*.[112] The Popularising Committee's most important innovation was the implementation of a second, non-technical, journal – *Spaceflight* - in October 1956, targeted at the space-interested lay public. Commercial publishers had previously alerted the Council to the potential market for such a journal, as with *Sky and Telescope*, but now the time was judged to be critical for its launch. Astronomer Patrick Moore, BIS Fellow and a talented and lucid expositor, was installed as first editor.[113]

The Council judged the results of their popularising strategy to have been a success.[114] According to the goals stated by BIS Chairman, Ralph Smith, and Frederick C Durant III, then President of the IAF, in the first editorial of *Spaceflight*, this success was defined as the opportunity to prevent the potential effects of media misrepresentation on their reputation and the development of spaceflight. They were particularly keen to counter what they perceived as alarmist coverage of Cold War weaponry across the mass media by undermining the mediating role of journalists and broadcasters.[115] The new journal, however, was not without its problems. *Spaceflight* struggled commercially in terms of circulation numbers, unable to compete with the mass media coverage of space research and news. Administratively, Moore resigned in acrimony from the editorship and, eventually, from the Council, following a critical book review circulated by one of his Fellows.[116] Despite such struggles, the Council persisted with *Spaceflight* because they viewed it one of the only methods by which Fellows could address more diverse audiences directly.

In reality, the popularising strategy reached few new potential members and supporters and made little difference to the influence of the BIS over developments in the rocketry age. Fellows had contributed to the institutionalisation of space science as a discipline but had not capitalised on the postwar opportunity to encourage and become a crucial factor in the development of spaceflight. The policy of the Council had secured the technical reputation of the BIS but a cautious promotional strategy had limited its ability to even act as an important supporting node in the field. Though this caution was recognised as a

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[111] *BIS Archive* CM Box 79C 1: 5 Mar 1955, 4 June 1955, 1 Oct 1955, 3 Dec 1955, 7 Jan 1956, 4 Feb 1956, 3 Mar 1956, 2 June 1956.

[112] B Parkinson (2008).

[113] P Moore (1956): *Spaceflight*: 1. *BIS Archive* CM Box 79C 1: 6 Oct 1951, 5 Mar 1955.

[114] Parkinson, *op. cit.*

[115] RA Smith (1956): *Spaceflight*: 2-3. FC Durant III (1956), *Spaceflight*: 2.

[116] *BIS Archive* CM Box 79C 1: Undated report by Moore on *Spaceflight*; 8 Sept 1956, 11 Aug 1956, 25 Aug 1956, 5 Jan 1957, 17 Aug 1957, 2 Nov 1957, 7 Feb 1959, 30 May 1959, 8 Aug 1959.

problem by Fellows, their distrust of the media was inhibiting. Just as the influence of the BIS was becoming a serious issue, the orbit of Sputnik heralded the onset of the space and spaceflight age and offered the BIS another opportunity to play a central role in bringing about its goals of interplanetary travel.

A reluctant advocacy group with an embedded distrust of the media: The invisibility of the BIS in the space age

In October 1957, the shock caused by the orbit of the Soviet satellite Sputnik thrust space technology centre stage in world affairs. Sputnik also created a media storm, with the press and broadcasters quick to latch on to the political and dramatic newsvalues of the space age. In addition, the orbit of the satellite rendered the conquest of space a reality, a reality that would be intensively pursued over the next decade. These developments were critical to the function and activities of the BIS in the space age, a period in which their interplanetary goals seemed tangible and space science was never far from the headlines.

Despite this tangibility, and despite the Council's commitment to promotional dynamism the previous year, Fellows did not extensively seek to capitalise on the widespread popular interest in space created by Sputnik to encourage space scientists to apply their efforts towards the development of spaceflight. However, in a slight shift of policy, the Council did not actively discourage members from engaging with the media, though they were not actively encouraged to do so either. When the *Daily Mirror* heralded the opening days of the space age with their *Space Mirror* coverage, the space future illustrations of Ralph Smith and Chesley Bonestell, both Fellows, rocket engineers and artists, played a significant role.[117] In addition, Council members assisted the BBC astronomy presenter, Dr JG Porter, in compiling information on satellites for use in programming.[118] Overall, though, the BIS did not project a highly visible public presence in the period following Sputnik. These isolated media appearances were both reactive and opportunistic rather than part of a defined strategy. This strategy was indicative of the attitudes of the BIS Council throughout the space age.

The conservative promotional attitude of the Council was to a large extent determined by Fellows' entrenched concerns at the potential impact of media images and interpretations

[117] For example: *Daily Mirror* 14 Oct 1957, pp. 11-13 and 15 Oct 1957, p. 11.

[118] *BIS Archive* CM Box 79C 1: 4 Jan 1958.

of the BIS on its reputation. As the Council agreed, the popular representations of Smith and Bonestell, for example, if low quality, being the "shop window" of the BIS, could spoil its good name.[119] Current Fellow Mark Hempsell suggested that the Council was particularly apprehensive of the fact that media professionals increasingly eschewed the scientific context in coverage of space science.[120] Certainly, Fellows felt that engaging with the media had significant drawbacks as well as considerable advantages, even with the renewed production influence bestowed upon them due to the newsworthiness of events. Even the specialist print media, traditionally a safe channel for the Fellows to exploit, was coming to be feared as it adopted a more journalistic orientation, as seen in chapter three. On one occasion, for example, legal action was threatened against the *New Scientist* following critical comments on the BIS and its members.[121] In light of these developments in the culture of media science, the Council moved to rein in the promotional efforts of members and constrain the information regarding the BIS that was allowed to circulate publicly to protect its reputation.[122]

This decision manifested itself in the restoration of a policy that favoured supporting – that is, facilitating and coordinating – over promoting the development of spaceflight in the advocacy function of the BIS. Accordingly, the Council sought to re-associate and re-align the BIS with aeronautical and rocketry partners in the space science and engineering communities who were considered more influential, though members were individually influential in these communities. Fellows were keen for the BIS to associatively benefit from the interest raised in, and favourable media coverage of, the meetings and symposia of the likes of Hawker-Siddeley and the Royal Aeronautical Society.[123] For the same reasons, and hoping to profit from the professional respectability of these fields, a change of name and emphasis to rocketry or astronautics was mooted among the Council.[124] Fellows hoped that by consolidating a supporting role for the BIS in the space science field, they would be able to focus attention on the importance of striving for expansive space exploration.

For the promotional aspect of the advocacy of the BIS, meanwhile, occasional attempts to directly popularise Fellows' technical activities to wider audiences was favoured over

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[119] *BIS Archive* CM Box 79C 1: 12 Apr 1958, 7 Feb 1959.

[120] Hempsell, *op. cit*.

[121] *BIS Archive* CM Box 79C 1: 1 Feb 1958, 16 Sept 1958 Information Bulletin, 14 Nov 1958 Information Bulletin, 6 Dec 1958.

[122] *BIS Archive* CM Box 79C 1: 6 Dec 1958, 4 July 1959. *JRUL SC JBA* File CS2/4/2: 8 Dec 1958 letter from FS Barrow to Lovell.

[123] *BIS Archive* CM Box 79C 1: 3 May 1958, 7 June 1958, July 1958 Information Bulletin, 1 Nov 1958, 10 Jan 1959, 30 May 1959; PC File 10: *Derby Evening Telegraph* p. 3 13 Nov 1958, *British Communications and Electronics* May 1959.

[124] *BIS Archive* CM Box 79C 2: Undated report from Carter on a 'British Rocket Society', 10 Apr 1965, 8 May 1965.

promotion that sought to gather widespread popular support.[125] Interactions with the media were mostly restricted to events such as the IAC, particularly its second visit to London in 1959 with the media facilities and interest coordinated and managed by the BIS.[126] With media coverage of such events remaining favourable, largely because media professionals, who allowed them to implement their PR strategies, deferred to Fellows, it is clear that the BIS could both encourage progress in the space age and improve its influence thereon.[127] However, the inability of Fellows to prevent potential unfavourable mass media images and messages concerning the BIS and its work – because media culture held production authority – inhibited their attitudes concerning their space age promotional strategy. The perception among Council members of the lack of influence over the production of popular representations of the BIS prevented them from capitalising on the post-Sputnik space enthusiasm.

The preoccupation with the reputation and function of the BIS in the field among the Council evaporated in the autumn of 1959 with the first murmurings of national space policy retreat. At this time, the military Blue Streak missile, a crucial part of Britain's rocketry capability, was threatened with cancellation. Fellows were privy to these proposals and invited the Minister of Supply, Aubrey Jones, to the London IAC to try to convince him of the necessity of maintaining a space launcher. As the press reported, Jones disappointed the audience by stating that future policy on the subject was a political rather than academic or industrial judgment and that the BIS would not play a part in the political debates.[128] The public humiliation of the wide reporting of the inability of the BIS to overturn such policy retreat galvanised the Council who realised that their lack of influence was jeopardising the development of spaceflight.[129] Fellows resolved to overcome their fear of the potential pitfalls of engaging with the media to aggressively promote the science and technology of astronautics and aeronautics. They hoped this strategy would encourage further progress in and restore the importance of the BIS to supporting the development of spaceflight.[130]

Once again, in practice, the Council did not implement the aggressive strategy they had promised. The only appearances of the BIS in the political debates in the media were when Fellows echoed the political rhetoric of the more mainstream rocket engineering community, and particularly the prevailing nationalistic concern with Britain's industrial

[125] *BIS Archive* CM Box 79C 1: 11 July 1959, 23 Nov 1959, 16 Jan 1960.

[126] *BIS Archive* CM Box 79C 1: 14 Oct 1958, 3 Jan 1959, 7 Mar 1959, Information Bulletin, 26 May 1959 Information Bulletin, 29 June 1959 Information Bulletin, 4 July 1959, 11 July 1959, 4 Aug 1959, 3 Oct 1959.

[127] *The Times* 27 Aug 1958, p. 7, col. F., 28 Aug 1958, p. 7, col. B.

[128] *The Times* 1 Sept1959, p. 5, col. F.

[129] *BIS Archive* CM Box 79C 1: 1 Feb 1958, 7 Mar 1959, 30 May 1959, 23 Sept 1959 Information Bulletin; PC File 10: *Auckland Star* 2 Feb 1959.

[130] *BIS Archive* CM Box 79C 1: 30 Oct 1959 Information Bulletin, 23 Nov 1959 Information Bulletin, 11 June 1960.

competitiveness.[131] As a consequence, the influence of the BIS on the salvaging of Blue Streak was marginal. However, the decision to turn the military missile into a civilian European and Commonwealth launcher called Europa, to be developed through the European Launcher Development Organisation (ELDO), allowed the BIS the opportunity to continue to play a role in the development of space exploration.

The Council, again, looked to the ARS for advice on how best to capitalise on this policy reprieve and encourage and play a role in the development of spaceflight. Following this consultation with regard to the success of the ARS in encouraging the development of the US manned space programme, in late 1959 Fellows again recruited a press officer, this time William Dempster. In this role, Dempster was charged by Fellows to be both receptive to, and seek to engage, the interest of the media. However, this time, the Council insisted that they had learnt that the utility of a press officer relied upon the organisation undertaking newsworthy activities that he could 'sell' to the interests of media professionals.[132] Yet, despite this assertion, Dempster acted as more of a publicity consultant, with Fellows' promotional strategy remaining opportunistic and associative. Members were quoted in the media, for example, commenting on *Ariel 1*, Britain's first satellite launched in April 1962, and were eager to work with science writers such as Anthony Michaelis, of *Discovery* magazine and the *Daily Telegraph*, to claim priority, through Clarke, for the notion of satellites.[133] Their reactive and responsive strategy was, for a time, helped by the high profile and popular and media interest in the astronautical competition between Russia and the US, even if the BIS had little to with actual events. The Council exploited ceremonies held to herald celebrities such as Russian cosmonauts Yuri Gagarin and Valentina Tereshkova, and excitement surrounding the *Vostok* and *Mercury* manned exploration programmes, to advocate space exploration in the press, newsreels and in broadcasting, as with *The British in Space* as part of BBC *The Way We Live Now* series in June 1961.[134]

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[131] *BIS Archive* CM Box 79C 1: 9 November 1959 Information Bulletin, 23 Nov 1959 Information Bulletin, 12 Mar 1960, 11 June 1960, 6 Oct 1962, 9 Nov 1963; CM Box 79C 2: 29 Feb 1964, 31 Oct 1964; PC File 19: *Flight* Aug 1960 p. 182-183 by Kenneth Owen; *The Times* 27 June 1961. *JRUL SC JBA* File CS2/9/1: Greenwood to Lovell 1 Jul 1960, Pardoe to Lovell 4 Jul 1960.

[132] *BIS Archive* CM Box 79C 1: 30 Oct 1959 Information Bulletin, 23 Nov 1959 Information Bulletin, 11 June 1960, 10 Dec 1960.

[133] *BIS Archive* PC File 10: *Daily Telegraph* 1 Feb 1962. *The Times* 14 Sept 1959, p. 10, col. A, 13 June 1961, p. 5, col. F, 13 Aug 1962, p. 8, col. B.

[134] *BIS Archive* CM Box 79C 1: 21 Apr 1961, 29 July 1961, 6 Oct 1962, 9 Nov 1963; PC File 10: *The Woman Engineer* Summer 1961 p.4; CM Box 79C 2: 29 Feb 1964. *British Pathé* 10 Feb 1964.
BBC WAC File R19/2091/1: Script; Transmission 27 Jun 1961 Home Service; Letter from René Cutforth (Chair) to Mr Chabot 5 Jul 1961; Letter from Carter of recommendations 12 Jun 1961. Francis Dillon to Miss E Wakeham 26 June 1961, contracting Carter for supplying contacts.

This cautious promotional strategy remained a product of the concern that popular representations could damage the technical reputation of the BIS, especially mediated representations. However, certain members felt that the Council could have done more to exploit the promotional opportunities of the space race, especially with national policy seemingly in retreat. The Council did concede that more could be done in terms of promotion. However, Fellows employed the familiar defence that engaging with the media was too risky, even using PR methods, because they had little influence over the production, interpretation and portrayal of the activities of the BIS.[135] The evidence suggests that this defensive response was unfounded. In broadcasting, in particular, the eagerness of producers for space science material, and the formats of programmes, still offered experts much production influence. In *The British in Space* mentioned above, Carter, Golovine and Shepherd were extensively involved in providing contacts, material and speakers; though it is not clear how the programme was commissioned.[136]

In the spring of 1964, the Council admitted that their preoccupation with the reputation of the BIS had been at the expense of promotion and had, ironically given its aim, reduced the influence of the BIS as a supporter of the development of spaceflight. Most revealing was the fact that the membership of the BIS had actually declined since Sputnik. Fellows blamed this situation on developments in mass media popular science production that meant they were no longer able to directly present audience with selected images and messages rather than their promotional inactivity.[137] This distrust of engaging with the mass media meant that the Council had missed the opportunity to exploit the intense global interest in space matters to promote spaceflight and position the BIS as central to bringing about interplanetary travel.

In the middle 1960s, Fellows recognised that the lack of influence of the BIS was jeopardising the focus of space science being targeted towards space exploration, especially in Britain. The Council resolved that a strong membership was key to constructing an influential role for the BIS to be able to encourage this focus. Fellows, thus, implemented a policy of self-interest to promote an image of the BIS as dynamic, vigorous, active and up-to-date in the space science field.[138] Various strategies were discussed. An improvement in the advertising of members' technical output was considered crucial. Novel ideas included instigating a television and/or radio programme on the BIS to showcase its views and a lecture-demonstration education programme in

[135] *BIS Archive* CM Box 79C 1: 21 Apr 1961, 6 May 1961.

[136] *BBC WAC* File R19/2091/1: Script; Transmission 27 Jun 1961 Home Service; Letter from René Cutforth (Chair) to Mr Chabot 5 Jul 1961; Letter from Carter of recommendations 12 Jun 1961. Francis Dillon to Miss E Wakeham 26 June 1961, contracting Carter for supplying contacts.

[137] *BIS Archive* CM Box 79C 2: 2 May 1964.

[138] *BIS Archive* CM Box 79C 2: 4 Apr 1964, 2 May 1964, 4 July 1964, 5 Dec 1964.

partnership with the Ministry of Education and the US space institute NASA to spread interest and awareness of British space activity.[139] However, the Council's concerns at the risks to the legitimacy of the BIS of engaging with the media and popular spheres prevented most ideas from being implemented. Appearances in the mass media largely remained limited to Fellows' comments on superpower feats, such as the Soviet Luna 10 probe becoming the first man made object to enter lunar orbit.[140] Other efforts that sought to associate with less legitimate popular space science were actively discouraged. One member, for example, was prevented from representing the BIS on a BBC Northern broadcast, and a potential association with a 20th Century Fox space film and its publicity was rejected.[141]

Most Fellows were content with this piecemeal promotional policy. However, this policy meant that the membership of the BIS remained limited, as did its influence. This became an acute problem when government space policy retreat became terminal in the mid-1960s. Fellows were well aware of many politicians' desire to renege on certain space commitments and sought to privately lobby ministers, compiling reports detailing the commercial importance of space to the UK but without effect.[142] Even at this critical juncture in British space development, when there was intense political and public scrutiny of space science, and much criticism, only once did the BIS feature in the mass media encouraging the sustenance of national spaceflight development.[143] Part of the reason for this was that print media professionals in particular had developed their mediating identity and reporting expertise to such an extent that all experts, and even science writers, were less crucial to coverage, as we will see in chapter three. Nevertheless, the public calls made by BIS Fellows in the media for the preservation of an active national space policy was *after* the government had announced its intention to largely withdraw its interest in European space cooperation, including the crucial European Launcher Development Organisation (ELDO) launcher, as a foreign policy manoeuvre in June 1966.[144] This was a significant blow to their interplanetary travel aims, with the BIS having marginal influence over the events partly because this was a period dominated by the cancellation of blue-sky projects and their crippling distrust of engaging with the media prevented them from developing an advocacy presence that could seek to challenge such cancellations in the short term.

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[139] *BIS Archive* CM Box 79C 2: 13 Feb 1965, 10 Apr 1965, 8 May 1965, 10 July 1965, 11 Dec 1965, 12 Feb 1966.

[140] *BIS Archive* CM Box 79C 2: 14 May 1966. *The Times* 9 Apr 1966.

[141] *BIS Archive* CM Box 79C 2: 8 May 1965, 10 July 1965.

[142] *BIS Archive* CM Box 79C 2: 4 Apr 1964, 2 May 1964, 4 July 1964, 31 Oct 1964, 5 Dec 1964, 13 Feb 1965, 19 June 1965, 10 July 1965, 14 Aug 1965, 11 Dec 1965, 14 May 1966. *The Times* 14 Sept 1965.

[143] *Financial Times* 7 June 1966 p. 10 col. E.

[144] For more on this, see, for example: J Krige (2006).

In the late 1960s, national policy retreat and the lack of influence of the BIS thereover convinced the Council that their policies had to change. It was accepted that the name of the Society could be off-putting to potential members and "retarded the degree of political interest" in its activities.[145] Despite this, no institutional changes were agreed. Furthermore, no promotional changes were agreed either. Fellows stuck largely to their strategy of seeking to popularise their technical activities.[146] As had frequently been suggested before by PR-minded Fellows, the Council agreed that aggressive promotion was required to redress the lack of influence of the BIS and reverse the distancing of interplanetary travel. However, the Council also admitted, officially for the first time, their majority, embedded and overwhelming fear of the "potential for adverse publicity" of engaging with the mass media and its prospective effects on the professional reputation of the BIS. This fear was based on Fellows' mistaken belief that they had no influence over the production of popular representations of the BIS.[147]

As the *Apollo* programme was heading towards the climax of the space race, but with no plans to push beyond the moon, the interplanetary goals of the BIS seemed simultaneously near and distant. At this crucial juncture in the development of spaceflight, the BIS and IAF regretted the ineffectualness of space enthusiast groups in encouraging further exploration.[148] Though Fellows believed the BIS was respected professionally, they felt their weakness was in that they were excluded from government and policy decisions and that they had a low popular profile.[149] This vulnerability was exacerbated by a growing popular disenchantment, scientific ambivalence, media apathy and political indifference with regard to the BIS and human space exploration, especially after the first (and last) all-British built and launched satellite, Prospero, in 1971.[150] In the light of these developments, the Council agreed a new function for the BIS for the late 1960s. The aim was to build the reputation, membership and influence of the BIS such that it could play a crucial role in encouraging progress in spaceflight beyond *Apollo*.[151]

Popular promotion was intended to be a central strategy towards achieving this aim. Another PR officer was recommended, the utilisation of eager and prestigious members and contacts in relevant international bodies and the media was examined, and advertising the technical programme and policy recommendations of the BIS to the press

[145] *BIS Archive* CM Box 79C 2: 10 Dec 1966.

[146] *BIS Archive* CM Box 79C 2:10 Sept 1966, 10 Dec 1966, 10 June 1967, 7 Oct 1967, 13 Jan 1968, 17 Feb 1968, 6 Apr 1968, 8 Mar 1969.

[147] *BIS Archive* CM Box 79C 2: 7 Oct 1967.

[148] As opposed to D Millard (2005): 15-16.

[149] *BIS Archive* CM Box 79C 2: 29 June 1968, 17 Oct 1968.

[150] Millard, *op. cit.*, pp. 4-5, 7.

[151] *BIS Archive* CM Box 79C 2: 10 Dec 1966, 11 May 1968, 29 June 1968, 13 July 1968, 2 Nov 1968, 11 Jan 1969, 8 Mar 1969.

and sympathetic MPs was encouraged.[152] However, there is no evidence that any such proactive strategies were implemented in practice and widespread coverage of the BIS did not materialise. Instead, the Council once again remained faithful to their popularisation and sporadic reactive public promotion approach. Fellows were hoping to exploit the popular excitement and media demand aroused by the moon landings to encourage efforts towards interplanetary flight, and to consolidate the influence and reputation of the BIS in a supporting role in this effort by associating with such dramatic events. The Council released updated *Daedalus* plans through *Spaceflight* in February 1969, and did so again in 1977 with the design team under the leadership of influential space engineer Alan Bond aiming for Barnard's Star.[153] The Society presented awards to NASA administrators and astronauts, for which it successfully garnered press publicity, including by the science journalist AW Haslett in the *Times*.[154] Engineer-Fellows Val Cleaver and Geoffrey Pardoe contributed to a BBC *Panorama/Twenty-Four Hours* magazine discussion marking the moon landing, and sought to gain publicity on a special edition of *The Sky at Night*.[155] An article by Carter a week or so after the first moonwalk noted how Society inventions related to *Apollo 11*.[156] Later, the Council also marked the early emergence of the Shuttle and Spacelab, though strangely not the symbolic last British satellite Prospero, through press releases, with advocacy recommendations also sent to allied MPs.[157]

This cautious and responsive promotional strategy was, as ever, underpinned by the Council's concern that they had little influence over the production of popular representations of the BIS that were presented to audiences. Fellows expended more time and effort checking the favourability of popular representations than constructing them.[158] This distrust of the media also meant that the Council did not support Fellows eager to gain exposure and undertake promotion. Cleaver sought to engage with the prevailing rhetoric surrounding space science policy and justify the cost-effectiveness of interplanetary research in terms other than exploration, but his Council colleagues felt that apolitical promotion was the least risky approach even if it was less newsworthy.[159] Despite these attitudes to engaging with the media, the Council still felt that the BIS could, and did, make a crucial contribution to the encouragement of further astronautical space exploration as an advocacy group through both promotion and supporting the

[152] *BIS Archive* CM Box 79C 2: 11 May 1968, 29 June 1968, 13 July 1968, 2 Nov 1968, 11 Jan 1969.

[153] *Spaceflight* Mar 1974, and *Annals of Flight* Aug 1974.

[154] *The Times* 31 May 1969, p. 8, col. A. *BIS Archive* CM Box 79C 2: 14 June 1969, 13 Sept 1969, 29 Nov 1969, 12 Mar 1970.

[155] *BBC WAC* File T58/410/1: 'British Space Programme – 24 hours'.

[156] *BIS Archive* CM Box 79C 2: 8 Mar 1969, 5 July 1969; PC File 16: *Wednesday Sun* 30 July 1969.

[157] *BIS Archive* CM Box 79C 2: 11 June 1970, 12 Dec 1970, 8 Jan 1972, 5 Feb 1972, 29 Apr 1972, 11 Nov 1972.

[158] *BIS Archive* CM Box 79C 2: 17 Oct 1970.

[159] *JRAS* Dec 1969. *JRUL SC JBA* File CS7/8/3: Lovell to Cleaver 19 Mar 1971.

field.[160] In reality, promotion remained confined to popularising the technical activities of the BIS in the specialist presses and communities to build its legitimacy and influence as an important node and forum.[161]

Ultimately, the BIS had become largely invisible for an advocacy group. The onset of the space age had offered the Council another opportunity to construct the BIS as a central component in the encouragement of spaceflight and then, later, interplanetary travel. However, an inhibiting wariness of the potential damage to the reputation of the BIS of engaging with the media meant that Fellows implemented only a conservative promotional strategy. As a result, their corporate influence was limited which, in turn, limited the ability of the BIS to offer support to the space science field; ironically this supporting role was exactly what the Council was hoping to consolidate by protecting their reputation. In the end, the BIS was a marginal player in space age events and unable to influence trends that made their space exploration goals more remote. This marginality was recognised, with promotion identified as a solution. However, an overwhelming fear of adverse publicity prevented this solution from being implemented. The BIS had become a reluctant advocacy group.

There were some hints in the 1990s committee debates revealed in the introduction that Fellows such as Hempsell, and media-members such as Booth, were coming to realise that actively engaging with the media was necessary and could be beneficial. However, it would take time for the Council to overcome its embedded fear of public promotion and successfully reclaim some measure of direct access to audiences by learning to appreciate and manipulate the media culture that dominated production of popular scientific representations. There is evidence, here, that members were coming to appreciate the fluidity of the common production arena.

Conclusion

The Council rationalised their conservative promotional policy by blaming an irresponsible and uncontrollable media, a standard defence mechanism among scientific experts.[162]

[160] *BIS Archive* CM Box 79C 2: 9 June 1973, 9 Mar 1974, 12 Feb 1977, 22 July 1978, 18 Feb 1978, 14 Oct 1978, 16 Dec 1978, 8 Sept 1979, 26 Sept 1981.

[161] *BIS Archive* CM Box 79C 2: 14 Apr 1973, 8 Dec 1973, 9 June 1973, 12 Feb 1977, 18 Feb 1978, 16 Dec 1978, 13 Jan 1979, 21 Apr 1979, 15 Oct 1981; PC File 16: *The Chronicle Herald* 21 Jan 1978, *South London Press* 23 Jan 1981, pp. 16-17, *Eastern Daily Press* 21 Dec 1982, *Portsmouth Evening News* undated. PC File 19: *Orbit* May 1985. A Bond et al. (1978): *JBIS*, Supplement.

[162] Nelkin, *op. cit.*, preface, among others.

During the 1990s debates on the nature of the BIS as an advocacy group, Mark Hempsell admitted that Fellows felt that media professionals viewed the BIS, and space more generally, as a source of public entertainment.[163] The respected space scientist Desmond King-Hele sympathised, having experienced problems with the "standards of the coverage and courtesy of the media" regarding his contributions to articles and broadcasts on *Skylab*.[164] This perception meant that the Council largely saw engaging with the media as risky, and, especially, as a potential source of uncontrollable, unwelcome and unfavourable popular interpretations of the BIS. These interpretations, Fellows believed, could adversely affect their efforts to frame the work of the esoteric BIS as scientifically legitimate. Other, more PR-minded members, however, argued that enjoying a respected technical reputation was meaningless unless the BIS also enjoyed influence as an advocacy group over the development of spaceflight. They insisted that promoting was just as important as supporting work in the field, especially with political disinterest in space exploration, even at the risk of a certain amount of injury to the reputation of the BIS.[165] This institutional tension defined Council discussions of BIS policy throughout most of its existence.

Fellows' fear of engaging with the media was embedded from the interwar years. Despite the fact that the BIS was founded and consolidated by the efforts of Cleator and others who understood how to exploit the media, there were always those among the Council that resented the increasing inability to directly address lay audiences. Quickly, those that preferred to avoid promotion came to dominate the BIS hierarchy. The Council recognised numerous opportunities to undertake extensive mass media promotion to encourage the development of spaceflight and, later, the push towards interplanetary travel. Yet, Fellows' wariness of representations of the BIS being mediated and interpreted inhibited the promotional activities they actually undertook, even when progress towards the conquest of space was becoming retrograde. The Council was largely paralysed in terms of promotion because of their perceived, and, in newsworthy instances, unfounded, lack of influence over the production of popular representations of the BIS. The production authority of media professionals was an overwhelming concern for Fellows. As a result, the BIS retreated from the space science-media-public interface and became a marginal player in the promotion and support of the encouragement of the development of space travel.

The Council identified a concern with the fact that media professionals were extending their social identities in, and cultural authority over, the common production arena. This

[163] *BIS Archive* Box Spin-Off 1: letter to Hempsell from Booth 9 June 1995; letter from Miles to Chris Welch 23 June 1995; correspondence between Booth and Hempsell 3 July 1995 and reply. M Hempsell (2008).
[164] D King-Hele (1992): 469, 471.
[165] *BIS Archive* Box Spin-Off 1: letter to Hempsell from Booth 9 June 1995; letter from Miles to Chris Welch 23 June 1995; correspondence between Booth and Hempsell 3 July 1995 and reply. M Hempsell (2008).

was a manifestation of the 'problem' of science in the media as early as the 1930s, and may not have been the first, given discussion of the capacity for scientists to influence their popular representations with the emergence of fledgling science writers in the scientific press at least as early as 1926.[166] This problem was a product of scientists' lessening capacity to directly popularise to mass audiences and, with popular images and messages now outside of their influence, was viewed as a threat to the social and cultural authority and expertise of BIS Fellows. However, the shared production forum was actually a much less hazardous and contested arena than the Council believed. Certain members, such as Cleator, Burgess, Clarke, Cleaver and Moore, understood the complexities of the interactions and negotiations in the arena in such a way that they were able to manipulate its relationships and mechanics to the advantage of the BIS. Apart from instances when the Council sought to implement PR and media management strategies that undermined the expertise of media professionals, the only tensions in an otherwise relatively uncontested production arena were perceived on the part of BIS Fellows. It is clear that the interactions and agendas at the interface between scientific and media actors were more complex and fluid than many on the BIS Council assumed, which explains why the 'problem' of science and the media was not mobilised by the scientific establishment until the 1970s.

In the subsequent chapters, I explore the developments I have identified here in the common production arena from the perspective of media professionals and science-mediating specialists. In particular, I explore the motivations of media executives and professionals in seeking to challenge the tradition of popularisation and extend their cultural authority over the arena, and the production discussions within this culture that were the principal influence over how mass media popular science developed. With competition for mass audiences the most distinctive feature of media industries in this period, I suggest motivations lay in hoping to exploit space science both in terms of entertaining and valuable content and the technology of production and distribution. I also analyse how this re-orientation of cultural authority in the arena influenced those who were hoping to forge a new social identity and expertise therein as science writers and science broadcasters. I argue that the professional development of these science-mediating specialists as media industry resources manifested itself in another 'problem'. However, as we shall see, because the interests of and benefits to scientists, media professionals and science-mediating specialists were frequently aligned, the most striking feature of the development of the production of mass media popular science is the fluid nature of the arena.

[166] *Nature* Nov 1926.

Chapter Three

"Scientific news written in a readable way": The development of science journalists

In his autobiography *Fifty Years With Science*, James Gerald (JG) Crowther wrote extensively of "inventing scientific journalism" in the 1920s. In Crowther's conception, scientific journalism was a profession in which scientists or science-trained reporters devoted themselves to the regular exposition of science in the print media.[1] In his unpublished autobiography *The Kerbstone of History*, a contemporary of Crowther's, Peter Ritchie Calder, also posited that this period saw the emergence of a new form of 'presentation' in journalism. Calder suggested that Crowther founded a new profession that developed into "staff journalists concerned with getting scientific information" for their editors and publishers.[2] In just these two comments we see two different definitions of the emergence of a profession that we know today as science journalism. A profession, or the notion of a profession, emerged in this interwar period but the story of the development of science journalism is complex.

Previous to the interwar period, editors and publishers had largely facilitated scientists' direct access to mass audiences. Scientific culture held authority over the common production arena relating to popular science in the print media allowing scientists to popularise. However, from the 1920s, print media journalists and proprietors recognised that public demand for popular scientific material was increasing. Editors and publishers also recognised that supplying this demand was a potential means to outcompete rivals for readers. These editors and publishers also wanted to serve this demand with copy on their own terms without relying on the services of scientist-popularisers. In this way, media actors first conceived of science journalism as the practice whereby reporters specialise in covering the science beat. Constructing science journalism as a specialist industry resource began the extension of media culture over the common production arena. Scientists were concerned at this challenge to their production authority and the consequences for their ability to directly influence popular representations of science. This reorientation of authority in the arena was the origin of the construction of the 'problem' of science in the media that the British Interplanetary Society (BIS) identified because of the potential threat to the social authority of science.

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[1] JG Crowther (1970): 41-51.

[2] *NLS MC RCA* Dep. 370/100: autobiography.

Public demand for popular scientific material switched the cultural authority of the arena. It was this public demand and the resulting switch of production authority that allowed science journalism to develop, a development governed by tense negotiations among science writers and print media executives in particular. I argue that embracing the analytical notion of science writers eases the understanding of the complexities of the development of science journalism. The term "science writer" can be used to describe any historical actor who specialised in mediating science in the print media. Forging and consolidating a science-mediating identity in the common production arena was contingent on demonstrating a need for practitioners' unique expertise. However, as the cultural production authority in the arena changed over the period from the 1920s to the 1970s the expertise that science writers had to demonstrate also changed.

At first, the tradition of deference to scientific authority held sway. As a result, professional popularisers or scientific journalists such as Peter Chalmers Mitchell and JG Crowther emerged whose expertise was in presenting science popularly in a way that, above all, was sympathetic towards the needs of the scientific community. Yet it quickly became clear that editors and publishers controlled access to lay audiences and their first priority was attracting readers. Ritchie Calder was the first of a new breed of science writers who reluctantly had to write to the interests of readers and the demands of editors and publishers rather than scientists. There was much overlap in the two approaches due to source dependence and deference but, eventually, Calder's descendants developed into science journalists. Combined with popular ambivalence to and print media criticism of science, the formalisation of science journalists as a media industry resource rather than as a scientific community resource was at the basis of the 'problem'. Science writers who identified with or demonstrated expertise in scientific journalism rather than science journalism had identities that were incompatible with the production arena and were marginalised.

The development of science journalism as a result of negotiations in the common production arena begins in the earliest interwar years. Particularly significant was Peter Chalmers Mitchell of the *Times*, and his reporting of various astronomical expeditions led by Arthur Eddington to confirm Albert Einstein's relativity theory. Mitchell's appointment to the newspaper's staff was the first explicit admission by a press editor that popular science writers could provide distinctive and valuable copy with which to attract readers. Mitchell's appointment also highlights both that editors and publishers considered regular journalists of insufficient expertise, and the efforts of scientist-popularisers too infrequent and self-servingly highbrow, to provide copy that would act as a competitive resource. There was an expertise-gap for the likes of Mitchell to exploit to forge a professional mediating science writing identity. However, it also became clear that there was an

underlying tension regarding cultural authority over the production arena that influenced the identity and expertise that science writers had to foreground at this time.

Peter Chalmers Mitchell: The first and last professional populariser

On 7 November 1919 there was a joint meeting of the Royal and Astronomical Societies. At the joint meeting it was reported that British observations of the May solar eclipse confirmed Einstein's general relativity theory and heralded a fundamental change in notions of space, time and the universe. According to his autobiography *My Fill of Days*, Peter Chalmers Mitchell was present at this meeting and the after-meeting dinner of the Royal Society Club. Mitchell was a journalist representing the *Times* and, with the support of his editor Wickham Steed, produced a leader on the proceedings for the following morning's newspaper. Over the next few days and months, Mitchell provided significant amounts of copy on the consequences for cosmology that generated much popular interest.[3] The exclusive copy that Mitchell provided encouraged Lord Northcliffe to seek to appoint a dedicated science journalist to supply his columns with distinctive and valuable popular scientific articles and commentaries that would help attract readers to the *Times*. Such a specialist reporting beat was different in construction from existing specialist correspondents who were experts who contributed occasional columns, such as Astronomical Correspondents who were authoritative astronomers who contributed weekly or monthly night sky star maps to newspapers for amateur enthusiast readers.

Northcliffe was proprietor of the *Times* and, experiencing the public demand for popular scientific material such as on cosmology following the role of science in the First World War, charged his editors with ensuring that his newspaper would cover the latest research. Mitchell was a prime candidate for the responsibility of reporting on science. Foremost, Mitchell was a respected biological researcher and administrator, including holding the post of Secretary of the Zoological Society of London (ZSL) from 1903 to 1935.[4] In this capacity Mitchell kept abreast with the latest trends in science and was guaranteed entrée to the exclusive workplaces of scientists. Mitchell, thus, had an advantage of access and expertise over regular writers and journalists seeking to present science in newspapers, books and magazines.[5] But Mitchell also had other attributes that marked him out as different to traditional authoritative scientist-popularisers such as astronomers James Jeans and Arthur Eddington, who frequently addressed the public in the print and

[3] PC Mitchell (1936): 259-275.

[4] Mitchell, *op. cit.*, pp. 193-213.

[5] Mitchell, *op. cit*. See also: *Times Archive* AHM/1/1/16: Mitchell to Edgar Montague Amphlett 20 Nov 1928.

broadcasting media.[6] Of particular importance to the editors of the *Times* when considering Mitchell as a candidate for the science journalist post was his previous experience of technical and general writing. For example, Mitchell recalled that in April 1896, following strange observations and speculations by a French astronomer, he wrote an article in the *Saturday Review* called 'Intelligence on Mars'. Mitchell claimed that, although he did not believe the conclusions, he was sure this inspired Wells' 1898 publication of *War of the Worlds*.[7] More significantly, Mitchell had contributed book reviews to the *Times Literary Supplement* from 1905 and had supplied news of zoo matters for the *Times* itself from 1911. In addition, Mitchell was an acquaintance of Northcliffe's from his time in the War Office. In 1921, Steed contracted Mitchell to the journalistic staff of the *Times*, part time alongside his ongoing ZSL duties.[8]

The selection of Mitchell as *Times* scientific correspondent highlights the first emergence of a science writer identity in the common production arena at the science-media interface. That Mitchell's position was "scientific correspondent" rather than "science correspondent" is significant because it was a product of the prevailing deference to scientific authority. The job title scientific correspondent signifies that expertise in science was just as, if not more, important than expertise in writing for the print media. Editors and publishers had recognised that supplying the audience interest with popular scientific material could be a resource in their competition for readers. Print media proprietors preferred science writers who were expert in writing for lay audiences. Yet, it was foremost the conceptions and norms of popularisation that Mitchell sought to demonstrate expertise in to forge and consolidate his professional identity.

For Mitchell's peers, a scientific correspondent was a good compromise, akin to having an ally in the media dedicated to creating popular representations of science that would reinforce its social authority at a time when it was encountering more public accountability.[9] In a sense, Mitchell was "delegated" the more mundane yet vital function of using his media platform and expertise to maintain the social authority of science through popularisation.[10] Mitchell certainly sought to distance himself from hack science journalism, sharing the opinion of many scientists that "press men had their own idea of what was copy".[11] It was by demonstrating such a commitment and expertise in popularisation that he was invited onto the Royal and Astronomical Society committees involved with publicising the confirmation of general relativity. For a time, also, his *Times*

[6] PJ Bowler (2009): esp. 1-14.

[7] Mitchell, *op. cit.*, pp. 193-213.

[8] Mitchell, *op. cit.*, pp. 259-275, 294-295.

[9] Marcel LaFollette (1990): 45. P Conrad (1999): 285-287.

[10] AD Abbott (1988): 41.

[11] Mitchell, *op. cit.*

editors welcomed Mitchell's contributions. He wrote occasional scientific leaders under Steed and from 1921 he supplied a weekly scientific article called the 'Progress of Science'. Space science continued to provide notable developments on which Mitchell could base numerous articles.[12] However, editors and publishers were increasingly keen to cover the scientific beat on their own terms and sought to challenge the tradition of allowing scientist-popularisers unmediated access to columns. Print media proprietors were keen to construct science writing as a journalistic specialism rather than a mode of popularisation. Asserting their gatekeeping function, editors and publishers began to restrict access to audiences to those who were willing and able to demonstrate expertise in producing copy that would attract and interest readers.

The conception of science writing held by his press colleagues contrasted with Mitchell's notion of science writing. By explicitly refusing to identify himself with the conception of science journalism favoured by print media proprietors, Mitchell was admitting that he did not care to accept the authority of media culture over the production of popular science. Mitchell remained committed to popularising as a scientific correspondent. This was clearly a conflict of interest inside the *Times* office and a challenge to the professional identity and expertise of his journalist colleagues. Editorial support for his contributions thus waned, and Mitchell's weekly column became fortnightly in June 1924, and then ceased altogether in the middle of 1932.[13] Mitchell did not seek to act as a science writer again and died just before the war's end. His obituaries did not mention his contribution to the development of science in the press.[14]

This omission overlooks the role Mitchell played as a prominent progenitor in the development of science journalism. Mitchell was the first to occupy the science writing niche created by increased demand for popular scientific material in the print media, as noted in contemporary media commentaries.[15] Aligning with the prevailing production authority of the early interwar period, he sought to consolidate his scientific journalist identity by demonstrating his expertise in popularisation. Mitchell was a professional populariser, or what Frank Turner defined as a 'public scientist, one whose compositions rhetorically assumed that "science is worthy of receiving public attention, encouragement and financing".[16] However, editors and publishers were increasingly seeking science writers expert in reporting on science for their readers. To consolidate a mediating identity in the common production arena science writers had to begin to foreground their expertise in presenting science within the constraints of the print media in such a way that

[12] J Gregory and S Miller (2000): 140-148.

[13] Mitchell, *op. cit*.

[14] *The Manchester Guardian* 3 July 1945 p. 3.

[15] *Nature* Nov 1926.

[16] FM Turner (1980): 589-590.

would provide a resource to print media executives and proprietors. Yet source dependence meant that scientists retained a strong influence over production arena negotiations and the development of science writers. Mitchell had only sought the approval of his scientific community peers. His successor, JG Crowther, had to demonstrate his commitment to and expertise in both popularisation and science journalism in order to fulfil his vocational belief in science writing.

JG Crowther: A scientific journalist

As Mitchell's progress was stalling at the *Times* another science writer was seeking to forge a career in the field. JG Crowther had studied mathematics and physics at Cambridge before becoming a science teacher. In 1924 he joined the Oxford University Press (OUP) as a publisher of technical books. Around this time he began to explore socialism, becoming a particularly strident advocate of the rational application of science to the welfare and progress of the nation.[17] As part of his philosophy, Crowther believed that building a public understanding and appreciation of science was essential. Crowther felt that science writers could play a key role in building this public understanding and appreciation of science by systematically practising the exposition of science.[18] In the spring of 1926, he told his OUP Director Humphrey Milford that he was going to strive to make science writing his main occupation.[19]

If Crowther was to succeed in becoming a science writer he could not simply follow in the footsteps of Mitchell. Mitchell's expertise in and partisanship to science was a problem in a science writing production arena increasingly dominated by media culture. Editors and publishers were seeking, if at all, science writers who would act as science journalists. Crowther had to demonstrate that he had the requisite expertise to report on science in way that would attract and interest readers. Yet, a significant deference to the authority of science and scientists remained in British society, with journalists largely dependent on expert sources for scientific material and news. Crowther, thus, also had to demonstrate his commitment to and expertise in popularising science as per the traditions of the scientific community, a topic of frequent discussion in the contemporary scientific press regarding the capacity for scientists to influence their popular representations.[20] In addition, Crowther had to demonstrate that neither regular journalists turned to the

[17] Crowther's involvement with the social relations of science movement, as indeed Calder's role therein, has been noted elsewhere. For more on this movement see: W McGucken (1984) and G Werskey (1988).

[18] Crowther (1970), *op. cit.*, pp. 7-8, 41-51.

[19] *SxMs29* Box 6: Milford to Crowther 22 Mar 1926.

[20] J Hughes (2007): 11-13.

science beat nor professional scientist-popularisers were adequate. When considered together, Crowther had to demonstrate to both media and scientific cultures not only that his expertise was in mediating science but that such a specialist identity was viable, valuable and necessary in the production arena.

Throughout 1926, Crowther contributed occasional articles to the left-wing print media whose editors were more amenable to copy on the social relations of science, but had been unable to interest publishers in investing in a new popular science journal.[21] Crowther had most success in the London Letter paragraph of the Liberal *Manchester Guardian*, striking up a valuable acquaintanceship with the London editor, James Bone. In September 1926, however, Bone wrote to Crowther to warn him that his articles, though often containing interesting material, were mostly unsuitable for publication in a newspaper. Bone suggested that his articles would be better suited to a periodical, from which he might also be able to gather better recompense. Crowther's style, at this point, did not differ significantly from that of Mitchell, and was much nearer the conception of popularisation than science journalism. Bone stressed that editors in the newspaper press, at least, wanted to frame popular science as science reportage as that was what they believed would interest readers, a perception that still resonates today.[22] Bone pointed Crowther to the "strange lights and explosions in the north", as had been recently featured in *The Times*, as the sort of science news the *Guardian* was looking for. Crowther responded quickly and the following day, September 9, the *Guardian* carried an article by him on the meteor.[23] Such developments and news in space science provided regular opportunities for Crowther to submit articles and copy that, at least, commanded the attention of print media editors.[24]

Following these negotiations, Crowther felt he had absorbed the lessons regarding editors' and publishers' – the gatekeepers – conceptions of science journalism. He also felt that if he was to systematically expound popularly on science then, like Mitchell, he required a media commission. In late 1926, however, Crowther was rebuffed when he approached JL Garvin, Director of *The Observer*, with the aim of creating what he defined as the profession of "scientific journalism".[25] In early 1927, as we shall see in chapter four, he also sought to become a science-mediating specialist for the BBC, but he did not understand that the rules of the broadcast and print media were different, and especially that the different mechanics and techniques meant that media culture held authority over the common broadcast production arena. Following this realisation, Crowther focused on

[21] J Gregory (2010).

[22] D Nelkin (1987): 8-13, 109-111.

[23] *SxMs29* Box 6: Bone to Crowther 8 Sept 1926.

[24] *SxMs29* Box 125: Pringle to Crowther 17 July 1928.

[25] *SxMs29* Box 6: Crowther to Garvin Nov/Dec 1926; Box 125: 23 Nov 1926 essay on 'Science and Journalism'.

securing a position on the staff of a major newspaper whose proprietors were seeking new and interesting avenues for its staff to pursue in the intensifying competition for readers among the print media.[26] He favoured the *Guardian*, a wise choice given that he had previously received support from sections of its editorial staff, and because this newspaper had an organisation and policy committed to minority cultural interests.[27]

Fortunately for Crowther, the editor of the *Guardian*, CP Scott, recognised the potential value of science copy as a means to hold the attention of readers. For Scott, a science journalist on the staff would allow the *Guardian* to appeal to the increasing numbers of both the science-interested and science-trained readers. Ideally, Scott wanted a member of staff expert and specialising in presenting science in the print media. Unfortunately for Crowther, he was not the obvious choice for Scott to fill the position. Worse still for Crowther, he had inadvertently endorsed Julian Huxley as an ideal candidate in an article detailing Huxley's decision to eschew research and devote himself to teaching science popularly.[28] Huxley was a contemporary celebrity scientist respected both for his scientific credentials and prolific popularising talent, a regular in magazines, films, radio schedules and newspaper columns including in the *Guardian*.[29] Huxley's commitment to science writing and broadcasting was similar in both motive and conception to Crowther's. Thus, it was Huxley who Scott, understandably, approached as his choice for the post of science correspondent. Presumably to Crowther's relief, Huxley was too busy to accept the proposition, though *Guardian* editors such as WP Crozier continued to monitor Huxley's career progression with an eye to recruiting his services for the *Guardian*.[30]

Crowther learned from this incident that he would have to demonstrate not only the necessity for science writers but also the advantages of his science writing identity as an expert in presenting science in the print media compared to the authoritative and often lucid contributions of professional popularisers such as Huxley. In the same article on Huxley, then, Crowther made sure to emphasise that few would be able to emulate the likes of Jeans and Huxley because the "combination of research ability and fluency with pen and speech is too rare" among scientists.[31] Crowther also sought to publicly stress to that he had been inspired by, but had surpassed, the expertise in mediating science of talented scientist-popularisers such as Eddington, who tended to mystify readers.[32] Significantly, he argued to Crozier, among other *Guardian* editors, that he was unique in

[26] Hughes (2007), *op. cit.*, pp. 11-14.

[27] On the traditions of this paper see D Ayerst (1971): esp. 441.

[28] *SxMs29* Box 124: 'Prof. Julian Huxley' 13 May 1927.

[29] T Boon (2008): 82-86.

[30] JRUL SC MGA ECAS: Scott to Huxley 22 July 1925, Scott to Huxley 22 May 1927, Huxley to Scott 26 May 1927. *SxMs29* Box 126: Crozier to Crowther 11 Nov 1931.

[31] 'Prof. Julian Huxley', *op. cit*.

[32] *SxMs29* Box 124: 7 Feb 1927 'The Gifford Lectures'

having expertise in both science and the media so that only he would be able to present science in the manner required by print media editors and publishers. However, Crozier did not believe that Crowther's output was of a level intelligible enough to consistently attract readers.[33] In fact, *Guardian* editors still considered Crowther in the same professional identity and expertise frame as scientist-popularisers such as Mitchell for whom there was no need or place on the staff.[34]

It was Bone who supplied Crowther with a second crucial piece of advice and career direction for developing as a science writer rather than as a professional populariser like Mitchell. In early 1928, Bone told Crowther that print media editors wanted science copy that, above all, would appeal to readers, and that this required a certain style of presentation. Bone urged Crowther to report science by treating his editors as the "ignorantsia (sic) of Fleet Street" but representative of readers.[35] It was at this point that Crowther realised that media culture was enjoying a heightened influence over the development of science writing. Crowther understood that forging a science writer identity increasingly depended on demonstrating a commitment to, and expertise in, the media more than in science. It was Crowther's appreciation of editors' and publishers' conception of science writing as a specialist industry resource that allowed him to gain the support of editors and publishers. For example, the same year, Crowther published his first popular book, *Science for You*, which consisted largely of reproductions of his newspaper articles, particularly those on developments in British space science and astronomy.[36] Crowther's changed attitude to presentation, though his philosophy of promoting science remained the same, facilitated his eventual appointment to the *Guardian*'s staff. Crowther argued to Scott that offering him a commission would improve his articles and make the *Guardian* "easily pre-eminent among daily papers for its presentation of and attitude to science".[37] By deferring production authority to his editors, Crowther secured his appointment as the *Guardian*'s exclusive Scientific Correspondent in late 1928.[38]

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[33] *SxMs29* Box 6: Crozier to Crowther 17 Oct 1927.

[34] *SxMs29* Box 186: Internal note to Scott 26 Jan 1928. *JRUL SC MGA* ECAS: Crowther interviewed by Scott 26 Jan 1928, note on letter to Crowther from Crozier 22 Jan 1928, Scott to Monkhouse 19 Mar 1928, Roberts to Scott 25 Jan 1928, Scott to Roberts 30 Jan 1928.
Almost simultaneously, HA Roberts, of the University of Cambridge Appointments Board, had recommended HT Pledge for the *Guardian* staff, but Scott said there was no vacancy on the staff for a scientist-populariser of the history of science, even if admittedly talented.

[35] *SxMs29* Box 186: Bone to Crowther 26 Mar 1928.

[36] JG Crowther (1928): vii-viii, 46.

[37] *SxMs29* Box 6: Crowther to Scott 24 Nov 1928.

[38] *JRUL SC MGA* ECAS: Scott to Crowther 7 Dec 1928, Crowther to Scott 9 Dec 1928.

Crowther's contract with the *Guardian* was a blow to other editors keen to appoint him as their organ's specialist science reporter. For example, Crowther was approached in January 1929 by the editor of the Communist Party *Sunday Worker*, Walter Holmes, to contribute regular scientific paragraphs on topics such as the recent Siberian meteorite.[39] Similarly, Laurence Easterbrook of the *Express*, Gerald Barry of the *Weekend Review* and Kingsley Martin of the *New Statesman and Nation*, all courted Crowther in the hope of establishing a "connection in journalism from the angle of accurate scientific news written in a readable way".[40] Eagerness for scientific copy produced by print media specialists such as Crowther was spreading beyond those editors in the left wing newspaper press, despite practitioners often harbouring Marxist sympathies. In August 1929, the editor of the conservative daily *Morning Post*, Howell Gwynne, on the advice of Huxley, whom he had approached first, asked if Crowther would act as their scientific correspondent.[41] Gwynne turned to his third choice, Arthur Woods (AW) Haslett, a Cambridge natural sciences and history graduate. Haslett shared a similar background to Crowther and his vocational belief in science writing beyond the efforts of scientist-popularisers such as Jeans to improve the public relations of science. Like Crowther, Haslett also wrote popular books such as *Everyday Science* and *Unsolved Problems in Science*, published in 1936 and 1939 respectively, which explored the impact of contemporary science progress, such as the development of rocketry, on everyday life.[42] For Gwynne, Haslett was a credible and acceptable alternative to Crowther for the specialist journalistic post. Haslett accepted Gwynne's offer and acted as the scientific correspondent of the *Morning Post* from 1929 to 1937.

Demand for Crowther's services, and the form of science writing he had pioneered that was both scientific community-approved and lucid, extended beyond newspaper editors. Crowther worked up a connection with Albert G Ingalls, amateur astronomer and science editor of *Scientific American*, whom he had met at a Glasgow meeting of the British Association (BA), to supply articles to the US popular science magazine market.[43] In early 1930, WS Stallybrass of Routledge publishers considered Crowther as an author who could produce popular science output that could sell comparably with, if not better than, those written by the likes of Wells, Jeans and Eddington. This exchange resulted in the 1931 publication of Crowther's *An Outline of the Universe*.[44] However, Crowther's first duty was

[39] *SxMs29* Box 6: Holmes to Crowther 28 Jan 1929.

[40] *SxMs29* Box 15: Easterbrook to Crowther 25 Apr 1930, Crowther to Easterbrook 1 May 1930; Box 7: Barry to Crowther 29 Jan 1931, Martin to Crowther 4 June 1931.

[41] *SxMs29* Box 126: Crowther to Crozier 6 Aug 1929.

[42] *SxMs29* Box 15: Haslett to Crowther undated. AW Haslett (1936): ix, 1-10, 12-14, 341-344, 337-340. AW Haslett (1939): ix-xi, 285-306. *The Times*, 23 June 1969, p. 10, col. F.

[43] *SxMs29* Box 137a: Ingalls to Crowther 26 Aug 1929, 15 Oct 1929, 22 Oct 1929, 11 Apr 1930, 15 May 1930, 21 Jan 1931, 26 June 1931 and 26 Dec 1931.

[44] *SxMs29* Box 7: Crowther to Milford 2 Jan 1930.

to his *Guardian* commission. Into the early 1930s, Crowther consolidated his role as a Scientific Correspondent. Crowther frequently worked with WP Crozier, who had succeeded Scott as editor, to supply much copy of value to the *Guardian* in attracting and maintaining readers. Space science remained a prime subject for Crowther providing news on sunspots, the latest theories from British astronomers about the nature of the cosmos, solar eclipses, and Soviet meteorites, often with visual and illustrative opportunities. Crowther's editors suggested an article concerning a lecture by Mr Porterhouse, President of the Manchester Astronomical Society, on the question of the habitability of Mars, a subject they felt had an "undying fascination" for readers, for example. As for Crowther, he constructed an article around developments in cosmic rays that he felt readers would find "interesting" and wonderful.[45]

Yet, despite finding elevated editorial and publisher support for his expertise, in his 1931 book *An Outline of the Universe* Crowther claimed that scientific journalism remained "ill-defined".[46] Two years after his appointment, only Haslett had joined him as a professional science writer. The lack of institutionalisation of science writers was partly because specialist reporters are not cost-effective for editors in terms of volume of output.[47] This lack of cost-effectiveness manifested itself in two ways. Firstly, a wage that Crowther considered a "joke" for the arduous work involved in constructing and presenting science in the print media, and which indicated that editors and publishers did not appreciate the expertise of science writers.[48] Secondly, the lingering preference of print media proprietors and executives to continue to solicit occasional contributions from scientist-popularisers. Crowther's own contract contained a caveat that he was to secure contributions from his scientific contacts.[49] In addition, newspaper editors were amenable to submissions from scientific experts seeking to address mass lay audiences unmediated. For example, Dr Darwin Lyon, a US physicist and meteorologist experimenting with rockets at an observatory in Davos, was afforded access to the columns with highly technical articles after personally contacting Scott.[50]

On the first issue, journalistic remuneration remained a perennial concern for Crowther. However, the undermining of science writers' mediating identity and expertise by scientist-popularisers was becoming of less importance. Crowther appreciated the appeal for editors and publishers of the likes of Eddington and Jeans as science writers because of their "exceptional expository talent" and the extent of popular interest in subjects such as

[45] *SxMs29* Box 6: Scott to Crowther 6 Nov 1929; Box 126: Crozier to Crowther 15 July 1932. *The Manchester Guardian* 28 Dec 1933 p. 9.

[46] JG Crowther (1931): xiii-xiv, 122-161.

[47] S Dunwoody (2008): 15-19.

[48] *SxMs29* Box 137b: Crowther to Barry 31 Dec 1931.

[49] *SxMs29* Box 6: Crowther to Scott 24 Nov 1928.

[50] *JRUL SC MGA* ECAS: Lyon to Scott 9 Mar 1931. *The Manchester Guardian* 19 Jan 1931 p. 10 and 6 Apr 1931 p. 7.

space science.[51] Yet, print media executives and proprietors found that contributions from scientific experts were becoming of less value in their competition for readers. The attraction to an eminent name remained but editors and publishers increasingly found that such authors were interfering and demanding of production control, and relatively expensive for the low standard of copy they produced, which was often alienatingly highbrow. In this sense, scientific journalism became a distinct science writing profession because of the expertise of practitioners in producing popular science copy that was both scientifically sound and engaging, at least in the judgment of their editorial employers. Crozier, certainly, appreciated the expertise of Crowther as a specialist on his staff that could supply copy that would attract readers but not scientific community criticism. Crozier told Crowther that soliciting contributions from his expert contacts was "superfluous" and no longer necessary, and they collaborated in trialling a semi-regular column on the 'Progress of Science'.[52] Such was the value of scientific journalism, now, as an industry resource that Crozier stressed that he would not want to share Crowther or his contributions with other outlets such as the *News Chronicle* as a "general principle".[53]

Crowther's institutionalisation at the *Guardian*, and that of science writing in the print media, had certainly progressed. However, the formalisation of science writing was less clear and would, ultimately, hinder the further institutionalisation of professional science writers. Preventing the formalisation of science writers was the differing conceptions of the necessary expertise of its practitioners, on the one hand, and editors and publishers on the other. Crowther wrote to cosmic ray physicist and socialist ally Patrick Blackett that he was unable to practise his notion of scientific journalism within the constraints of working for a newspaper whose editors favoured more 'lowbrow' science coverage.[54] Crowther had hoped that securing a media commission would allow him to implement systematic popularisation that would build public understanding and appreciation of science. Print media executives and proprietors, though, had other motivations and conceptions of scientific journalism, and ultimately defined the policy of their scientific correspondents. Crozier, for example, constructed the professional identity of a Scientific Correspondent as one expert in supplying popular scientific copy on subjects, such as sunspots, that appealed to the perceived interests of the ordinary man in the street.[55] With media culture extending its authority over the production arena, Crowther's motive and conception clashed with that of his *Guardian* editors, and represented a conflict of interest and professional identity and expertise in the newspaper office.

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[51] *The Manchester Guardian* 30 Sept 1931 p. 9. *SxMs29* Box 126: Draft 'The Cosmos' article, in print 29 July 1932.

[52] *SxMs29* Box 126: Crozier to Crowther 25 Nov 1931, Crozier to Crowther 15 July 1932, Crozier to Crowther 22 Dec 1932.

[53] *SxMs29* Box 127: Crowther to Crozier 23 July 1934, Crozier to Crowther 29 July 1934 and 30 July 1934.

[54] *SxMs29* Box 192: Crowther to Blackett 9 Jan 1931.

[55] *SxMs29* Box 126: Crozier to Crowther 22 Dec 1932; Box 127: Pringle to Crowther 18 Dec 1935, Crowther to Pringle 13 Jan 1936.

Crowther's socialist philosophy was not the only reason why he chose to foreground his expertise in, and partisanship towards, science, and the motive behind why he sought to popularise professionally. Print media professionals remained dependent on scientific experts as sources. At this time, this source dependence frequently manifested itself in terms of writers deferring production influence to scientists. Crowther cultivated scientific contacts to such an extent that, for example, Jeans enjoyed disproportionate and sometimes misleading exposure in his 1929 book *Short Stories in Science*, even for theories that were later proved wrong.[56] Science writers required the cooperation of scientists and had to foreground some expertise in and commitment to protecting the social authority of science to secure this cooperation, a situation that still resonates today.[57] In fact, Crowther became a trusted publicist for much of the scientific community, though there were hints that certain scientists felt he was biased towards his contacts and that his identification with the media was a problem.[58] As Jeff Hughes notes, Crowther's commitment to scientific journalists taking on the baton of popularisation was most obviously seen in his role as press officer to the Cavendish Laboratory in the early 1930s.[59]

Such a commitment to popularisation rather than science journalism meant that Crowther's science writing identity was secure in the scientific community but not in the media culture. In fact, his professional identity was under threat because he was either unwilling or unable to demonstrate the expertise in mediating science that editors' and publishers' demanded. At the *Guardian*, for example, Crowther's editors felt that it was barely "practicable" for science writers to produce generally interesting and intelligible scientific copy for the print media in their current professional form.[60] Crowther did not act as a science journalist and there was some inherent tension in the *Guardian* offices because he associated and aligned with scientists, friction that science writers can still experience today.[61] It is significant that he was appointed Scientific Correspondent rather than Science Correspondent, his job title signifying that he was the *Guardian*'s exclusive scientist-writer rather than their science journalist. It was also noted by his peers that science writers in this form was tantamount to having a scientific expert of journalist with "scientific susceptibilities" within the office.[62] Ultimately, Crowther's middleman identity and expertise was not recognised in either scientific or media culture.

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[56] JG Crowther (1929): v.

[57] MC LaFollette (1990): 158-159, 173.

[58] *SxMs29* Box 126: Crozier to Crowther 26 Mar 1931

[59] J Hughes (unpublished).

[60] *SxMs29* Box 126: Crozier to Crowther 22 Dec 1932; Box 127: Pringle to Crowther 18 Dec 1935, Crowther to Pringle 13 Jan 1936.

[61] J Franklin (2007): 143-148.

[62] *SxMs29* Box 126: Crowther to Crozier 10 May 1929, Crozier to Crowther 26 Mar 1931; Box 127: Pringle to Crowther 12 Nov 1935.

In a 1936 *Nature* article on 'Science in the Public Press in Britain', Crowther argued that editors and publishers had not embraced science writing in the form that he practised or sought to practise. Crowther also recognised that print media proprietors and executives had differing conceptions of science writing than popularisation as a social duty.[63] With editors and publishers gaining production authority, scientific journalism was incompatible with science journalism as an industry resource. Crowther had believed that science writers had to act as boundary spanners whose identity was dependent on demonstrating both scientific and media expertise. Print media executives and proprietors, however, sought science writers who were expert in media science. It could be said that the *Guardian* editors allowed Crowther scope to define his role as a professional populariser and then regretted it. As Crowther's efforts to forge a science writing identity was stalling, Ritchie Calder was offering an alternative professional identity. Calder's identity was based on demonstrating his expertise in presenting science to lay audiences in the print media. Calder was, thus, more successful than Crowther in negotiations with editors and publishers regarding their notion of science journalism as a specialist reporting niche. However, Calder's partisanship to science, which he shared with Crowther, remained a conflict of interest in terms of print media professionals seeking to attract audiences.

Ritchie Calder: Disguised public relations officer for science

Like JG Crowther, Ritchie Calder had a belief in the potential of science as a progressive force, if applied to social problems. Calder also shared Crowther's conviction of the importance of science writing to build public understanding and appreciation of science so that science would be applied in this manner.[64] Calder argued that all science writers – that is, scientific journalists such as Haslett or scientist-popularisers such as Jeans – had an urgent mission to unite science and society due to the acute economic, political and humanitarian crises of the 1930s. He urged science writers to urge citizens to urge politicians to form a rational social policy and not wait for a time when "a Sir James Jeans may be Secretary of State for Inter-Planetary Affairs, conducting disarmament conferences with Mars".[65] Calder, himself, advocated for scientific planning for human needs in magazine articles, broadcast programmes, the emerging documentary film movement with the documentarist Paul Rotha, popular books, and as a science writer in the columns of the *Daily Herald*.[66]

[63] *SxMs29* Box 137c: Gregory to Crowther 11 June 1936; Box 152: 'Science and the Press' 18 July 1936.

[64] *NLS MC RCA* Dep. 370/100: Undated notes.

[65] R Calder (1934): 269-286.

[66] Boon, *op. cit.*, pp. 139-150.

With scientists still playing a crucial production role as sources, for Calder's science writing campaign to succeed, he still required the acknowledgment and backing of the scientific community. Calder did receive the support of various high profile socialist scientists and writers, including Frederick Gowland Hopkins, then PRS, Jeans and HG Wells (who also wrote for the *Herald*), and particularly among the younger generations.[67] However, and unlike with Crowther, many scientific experts were suspicious of Calder because he had not received any scientific training and, worse, he was a journalist who would not defer influence over how science was represented to scientists. Calder overcame the suspicion of scientists, and gained entry to their laboratories, following an endorsement from the government Department of Scientific and Industrial Research (DSIR) and his effective demonstration of his commitment to, and talent for, conscientiously promoting science, if in a sensational and provocative style.[68] For example, as the geneticist JBS Haldane noted, Calder frequently spoke out against irresponsible journalism, as with reports of rocket expresses to the moon that BIS President Phillip Cleator also denounced.[69] Above all, Calder gained the support of the scientific community by arguing that science was becoming a part of the political economy, whether scientists wanted it to or not. Calder suggested that science required a "public relations officer" (PRO) and that he should fill this role.[70]

Winning the recognition of one's expertise by the scientific community was one necessary goal but, as Crowther found out, media culture was asserting its production authority meaning that a commitment to and expertise in presenting science in the print media for lay readers was of paramount importance in winning the approval of editors and publishers. Calder had an advantage in terms of media expertise in that he was a trained career journalist and understood the preoccupation of print media executives and proprietors with readership figures. It was his journalist's training that meant Calder refused to defer production influence to scientists because he felt he was expert in presenting information to lay readers. In fact, Calder stumbled into science writing almost accidentally. In 1930 a change in editorial personnel at the *Daily Herald* saw Calder assigned to the science beat. Calder had secured a scoop on a breakthrough in thyroid cancer treatment and the new editor Maurice Cowan assumed that Calder was the *Herald*'s science reporter. The fact that Cowan made this assumption and made Calder responsible for producing interesting and engaging copy on science demonstrates that the science writer identity was developing. Calder was accustomed to following the whims of editors and felt that science journalism offered him the chance to showcase his

[67] *NLS MC RCA* Acc. 12533/2: Wells to Calder 31 Oct 1933, Wells to Calder 9 Nov 1934; Acc. 12533/7: Jeans to Calder 18 Nov 1933. FG Hopkins in R Calder (1934): xi-xiv.

[68] R Calder (1934): esp. 138.

[69] *NLS MC RCA* Acc. 10318/54: *The Clarion* 24 Mar 1934.

[70] R Calder (1934): 269-286.

descriptive writing skills, having enjoyed the space romances of Jules Verne and HG Wells in his youth.[71]

Calder, at least at first, demonstrated his print media experience and expertise and provided much copy of value to a burgeoning popular Labour daily paper. However, it was his exposure to the science beat that inspired him to embark on his campaign to promote science and its application to welfare. As a specialist reporter with broad journalistic skills Calder, unlike Crowther, was, on occasion, still assigned to general news stories. In 1931 Calder witnessed the naval pay mutiny at Invergordon, one manifestation of the political and economic upheavals of the early 1930s that saw the unemployed rioting and a government crashing. Just a few days later Calder returned to the science beat to cover the British Association (BA) Centenary meeting. Calder found the esoteric debates of Eddington and Oliver Lodge on cosmology pretentious and flamboyantly unreal given the acute social problems of the period. Calder was frustrated by the lack of concern on both sides regarding the 'Ivory Tower' social isolation of science, and resolved that he would use his science writer platform to redress this situation and inform his readers about science as *the* social dynamic driving contemporary culture so that it was not exploited or, worse, neglected.[72] Only now did Calder seek to forge a professional identity and expertise as a science writer.

In 1933, Calder sought to instigate a feature campaign called 'Birth of the Future' in the columns of the *Herald* and, later, in a popular book. Calder argued to his editors that their readers could and must understand and enjoy critical discussions of science and its social implications. Cowan felt that the increasing public taste for popular science meant that the campaign would be of value to the *Herald* in attracting readers. Editorial director John Dunbar, however, felt the campaign would not be a resource, and was suspicious that Calder's commitment to the public relations of science might be at the expense of writing for readers who often harboured inhibitions regarding science.[73] Cowan and Dunbar agreed to give the 'Birth of the Future' column a trial and figures and correspondence quickly showed that it was a resource for the *Herald*. Calder's identity as a science writer was, thus, consolidated because of his expertise in producing a series that had been of much value to the newspaper because of its intense "interest and importance".[74] Calder, though sharing a similar motivation with Crowther to promote the public appreciation of science and act as a scientific journalist, made more concessions to the conception of science writers held by print media editors and publishers. In other words, Calder was more attuned to the terms of science journalism.

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[71] *NLS MC RCA* Dep. 370/100: autobiography, undated notes; Dep. 370/202 'Trilogy'; 'Finding Out'.

[72] *Ibid*.

[73] *Ibid*.

[74] *NLS MC RCA* Acc. 12533/7: Anon to Dunbar 9 Dec 1933.

Through the mid-1930s, enjoying both scientific and media community support and recognition of his identity and expertise in science writing, Calder wrote prolifically. In particular, he continued to contribute popular scientific copy to the columns of the *Herald* with his progressive slant. For example, Calder reported from scientific meetings and presidential lectures, such as Blackett's cosmic ray hunt, and commented critically on the political persecution of astronomers in civil war Spain.[75] As with Mitchell and Crowther, contemporary developments in space science provided Calder with much copy. However, it was the more fantastical and futuristic aspects of space science that were most important to Calder when he began to experiment with the best method of presenting the implications of science in the print media. Calder settled on prophetic or imagined future narratives for which space science frequently provided the vehicle. For example, in 'Any More for the Skylark!', Calder reviewed BIS President Phillip Cleator's publication of *Rockets Through Space*, and his friend HG Wells' film *Things to Come* (both 1936). In the article Calder questioned the sacrifices made to satisfy man's unconquerable urge to explore and reveal new esoteric knowledge rather than concentrating effort on solving social problems.[76] Similarly, in early 1938, Calder wrote 'It Happened in 1963' with one article outlining the potential cultural consequences of an age in which man had conquered space.[77] Later the same year, Calder worked with the *Herald*'s new editor, Edward Francis Williams, to instigate a daily feature 'Reporting Progress' to supply regular news of science and its relevant implications.[78]

However, despite the consolidation of his professional identity as a science writer, Calder's career, like those of Crowther and Haslett, stalled. Calder's 'Reporting Progress' column was dropped after just six weeks. The daily feature was dropped partly because Williams, who supported Calder, was replaced as editor, and partly because these editorial upheavals signalled a change in political orientation of the *Herald* in which criticisms of science policy was not welcomed.[79] The main reason why Calder's progress stalled, though, was the perception of his editors, like Dunbar suspected earlier, that Calder's personal philosophy was more committed to supplying social implications copy that served the interests of the scientific community than supplying science news to attract readers. Calder had begun at the *Herald* as a science reporter but ended as a "disguised" scientific journalist popularising science professionally.[80] It was for this reason that Calder, as he admitted, had always struggled to incorporate his methods into the *Herald*'s journalistic policy and style.[81] Calder remained on the staff of the *Herald* but concentrated more on

[75] *NLS MC RCA* Acc. 10318/37: *Daily Herald* 12 Feb 1938; Acc. 10318/35: *Daily Herald* 22 Aug 1938.

[76] *NLS MC RCA* Acc. 10318/36: *Daily Herald* 25 Feb 1936.

[77] *NLS MC RCA* Acc. 10318/37: *Daily Herald* 15 Jan 1938 and 18 Jan 1938.

[78] *NLS MC RCA* Acc. 10318/38: *Daily Herald* early Nov 1938.

[79] *NLS MC RCA* Acc. 12533/6: Calder to Williams 13 Dec 1938.

[80] *NLS MC RCA* Acc. 10318/59: 'Science and the Public' 15 Jan 1969.

[81] Calder to Williams 13 Dec 1938, *op. cit*.

encouraging social revolution, especially in his capacity as secretary of, and seeking to gain coverage for, HG Wells' *New World Order*.[82] Science writing as scientific journalism was not compatible with the conceptions of science journalism of editors and publishers who held cultural authority over the production arena.

The professional identity of the science writer had, certainly, been established in the interwar period. His peers, for example, considered Calder as the Science Correspondent of the Herald, even if he did not consider himself as such.[83] The science writer and science broadcaster Gerald Heard agreed that the interwar period had seen the emergence of a new occupation pioneered by Calder and Crowther – he called it "outlinery".[84] However, science writing was a profession on a weak footing. Crowther claimed that the brief fashionable "wave" of enterprising editors appointing scientific journalists had worn off. Crowther felt that the future prospects of science writing being a profession of equal status and resources as specialisms like sport, politics or crime were gloomy, especially with war on the horizon.[85] National security meant that much secrecy surrounded wartime science and science writers such as Calder and Crowther were seconded on state propaganda work due to their "special experience and qualifications" in presenting scientific information to the public.[86] In addition, and despite the importance of science news, editors and publishers such as Crozier admitted that the wartime pressures on the print media meant that it was even harder for scientific copy to "force its way in" to the columns.[87]

The interwar years were a formative stage for science writers but their formalisation and institutionalisation was hampered because practitioners bought into the notion of a boundary spanner identity. The likes of Calder and Crowther, like many science writers today, felt that the professional identity of a science writer was dependent on demonstrating a utility and expertise in both the scientific and media communities, with their divergent expectations.[88] In fact, demonstrating print media expertise, that is, supplying scientific copy that would attract mass lay readers, was more important. In large part because of their socialist philosophies, Calder and Crowther instead acted as what Heard called scientific "liaison officers" or "liaison experts", propagandists in other words.[89] Both, for example, played key roles in the public relations activities of the BA Division of Social and International Relations of Science that sought to circumvent the

[82] Boon, *op. cit.*, pp. 117-118.

[83] *NLS MC RCA* Acc. 10318/37: *John Bull* 29 Jan 1938.

[84] *NLS MC RCA* Acc. 10318/54: *Sunday Times* 11 Mar 1934.

[85] *SxMs29* Box 9: Undated Notes by Crowther; Box 127: Undated draft review of *The Birth of the Future*.

[86] *SxMs29* Box 8: HJ Hough (Director of Scientific Research, War Office) to Crowther 30 Sept 1938.

[87] *JRUL SC MGA* ECBS: Crozier to Crowther 16 Oct 1942.

[88] Nelkin, *op. cit.*, pp. 100-108.

[89] G Heard (1935b): 257-262.

focus of the media on competition and entertainment.[90] Demonstrating sympathy with the values of the scientific community was a means for science writers to glory in sharing the high prestige of science and in advancing the cause of science.[91] However, foregrounding scientific expertise to protect the social authority of science through popularisation involved a conflict of interest in newspaper and publishing offices.[92] This conflict of interest undermined the production authority of print media professionals, and was not compatible with the editors' notion of science journalism as a specialist industry resource. Only Calder fully appreciated the need for science writers to foreground their media expertise, even if he did not always choose to do so. Similarly, in the early postwar years, only Calder voiced the need to accede to editors' and publishers' conceptions of science journalism if science writing was to formalise and institutionalise.

Postwar science writing: The incompatibility of scientific journalism and science journalism

The role of science in the war, manifested, for example, in V-2 rockets, meant that popular interest in science was higher than ever. Postwar science promised developments that would revolutionise the world, while rocketry quickly moved from the technical arena to become a dominant factor in Cold War and international relations.[93] For print media executives and proprietors, popular scientific copy detailing the latest developments in science and some of the major stories of the day was, now, a much more crucial resource in the competition for mass lay readers.[94] In accordance with their increased authority over the production arena, editors and publishers constructed the specialist industry resource of science journalism. In this conception, science writers had, above all else, to foreground their commitment to and expertise in reporting and mediating science. Presenting science in a way that interested lay readers was more important than deferring to scientific experts. The notion of science writers as boundary spanners was no longer viable.

However, at first, the identities of practicing science writers remained firmly rooted in scientific journalism. Editors and publishers eager for scientific copy were forced to rely on science writers or scientist-popularisers who had print media experience and expertise

[90] PEP (1938): 32-34, 38-39.

[91] JC Burnham (1987): 194-200.

[92] Franklin, *op. cit.*, pp. 151-155.

[93] D Kilgore (2003): 1-30.

[94] Dunwoody, *op. cit*.

but who also sought to demonstrate their scientific expertise and commitment. In 1945 Crowther returned to the *Guardian* from his wartime commission. The same year, Gerald Barry recruited Calder to the liberal *News Chronicle* as Science Editor. In introducing the first of a regular *Science Survey* column, Barry acknowledged that Calder's expertise was in both writing popularly for the print media and in terms of his "grasp of modern trends and modern scientific developments".[95] Both Calder and Crowther hoped to use their commissions to continue to advocate for the integration of science and society, especially with concerns over the power of science in the atomic age.[96] Science writing remained a key tool for their campaign and their cause was helped by the release of news of secret wartime scientific discoveries such as radar and the profile and prestige of postwar science as a symbol of Britain's power on the global stage, as we will see in chapter six with Jodrell Bank.[97]

Despite the eagerness of print media executives and proprietors for popular scientific copy, interwar tensions regarding the practice of scientific journalism remained. First of all, Calder and Crowther's commitment to, and expertise in, promoting and publicising science meant that much of their time was taken up by membership of scientific committees, rather than covering the science beat. Barry, for example, reminded Calder that his first duty was to the paper and its news columns rather than his work for the UN or BA.[98] In addition, the insistence of Calder and Crowther on seeking to discuss and interpret the social implications of science irritated editors who wanted science writers who would report and critique science. Calder, for example, described a romantic future voyage of the *SS Skylark* to Mars or Venus, asking whether the resources allocated to space science would be better spent on social problems.[99] However, such articles rarely made it into print and caused much friction with editors. One of Crowther's first postwar articles was on the social implications of the atomic blasts in Japan but was vetoed by AP Wadsworth, who had succeeded Crozier as editor of the *Guardian*. Following this exchange, personal tensions between Wadsworth and Crowther were strained and perfunctory. Wadsworth and his fellow editors urged Crowther to concentrate on reporting science news, such as the opening of the Ministry of Supply Rocket Propulsion Establishment, but Crowther remained committed to the development of scientific journalism and found his access to print limited.[100]

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[95] *NLS MC RCA* Acc. 10318/25: *News Chronicle* 3 Oct 1945.

[96] *SxMs29* Box 92: Calder to Crowther 2 Nov 1949.

[97] *SxMs29* Box 85: Minutes 6 Oct 1947; Recommendations 9 Oct 1947.

[98] *NLS MC RCA* Acc. 10318/2: Diary entry 7 May 1946.

[99] *NLS MC RCA* Acc. 10318/25: *News Chronicle* 20 Mar 1946 and 27 Mar 1946.

[100] *JRUL SC MGA* ECBS: telegram Crowther to Wadsworth early Aug 1945, Wadsworth to Crowther 10 Aug 1945, Crowther to Wadsworth 12 Aug 1945, Wadsworth to Crowther 24 Aug 1945, Crowther to Wadsworth 28 Aug 1945, Wadsworth to Crowther 29 Aug 1945. *SxMs29* Box 129: Stanley J Barnes to Crowther 11 Aug 1947, AM Wood to Crowther 11 Mar 1948.

Editors and publishers, thus, urged science writers to foreground their media expertise and identity. However, practitioners such as Calder and Crowther remained committed to the boundary spanner identity of scientific journalists rather than the specialist industry resource of science journalists. A "self appointed elite" - Calder, Crowther, Haslett, Maurice Goldsmith, science editor of *Reynolds News*, Bill Dick, editor of the popular science magazine *Discovery*, and Anthony Michaelis later of the *Daily Telegraph* – sought to formalise and institutionalise their notions of the identity and expertise of science writers in the production arena.[101] On 5 May 1947 this elite formed the Association of British Science Writers (ABSW). The ABSW committee had the aim of establishing "science writing as a definite profession with appropriate status".[102] Membership was open to those who wrote (or broadcast) about science through the media and who earned the major part of their income from science writing. Yet, the Constitution and activities of the ABSW revealed that the profession they hoped to establish was scientific journalism rather than science journalism.

The committee hoped that the foundation of the ABSW would "ease the tensions and prejudices between the norms of journalism and the scientific community", especially given that science writers were increasingly beholden to, or expected to conform to, the former. The role of the ABSW was to help science writers and scientists pool their expertise to circumvent the production authority of media culture in order to make the needs of science known and understood.[103] Calder did raise the issue of how to ease the tensions with editors and publishers, but no discussion took place, and no concessions towards the conception of science journalism were made, except for naming the organisation the ABSW rather than the Association of British Scientific Journalists. Instead, the ABSW committee merely resolved to promote the value of scientific journalists to media executives and proprietors.[104] Council members even sought to politically exploit the 1949 Royal Commission into the Press, stressing the commercial trivialisation of science journalism and the importance of scientific journalism to a postwar world dependent on scientific power.[105]

However, it was print media executives and proprietors who held production authority and controlled access to the platforms science writers required. Newspaper editors, in particular, resisted such efforts to influence the development of science writers away from science journalism. Consequently, those science writers who identified most closely

[101] P Wright and N Morrison (1997).

[102] *SxMs29* Box 92: ABSW aims; ABSW rules; Minutes of first meeting 5 May 1947.

[103] *SxMs29* Box 92: Minutes 4th meeting 13 Nov 1947, Minutes of the 6th meeting 8 Jan 1948, Minutes 10th meeting, 8 March 1948, Minutes 15th meeting 25 Jan 1949, Minutes 16th meeting 22 Mar 1949.

[104] *NLS MC RCA* Acc. 10318/25: *The Newspaper World* 13 Oct 1945 and 17 May 1947; Acc. 10318/2: *World's Press News* 15 May 1947.

[105] *SxMs29* Box 128: Notes 'The Press and Science Writers' undated.

with scientific journalism found their employment opportunities limited. AW Haslett, for example, did not find a newspaper commission until he joined the *Times* in 1953, instead returning to Cambridge to study. Crowther's strained connection to the *Guardian* lapsed in 1949. As with scientist-popularisers, book and popular magazine publishers remained more amenable towards affording scientific journalists more production influence, at least for a time. Haslett founded and edited *Science To-day* in 1946, moving to edit *Science News* in 1951, in a science periodical market that came to fruition with *New Scientist* in the late 1950s.[106] Crowther wrote numerous popular science books, such as the 1958 reader *Radioastronomy and Radar*, in which he demonstrated his expertise in writing for lay readers and his commitment to the social relations of science.[107] The ABSW, as a corporate body committed to scientific journalism, though expanding, had little impact on the development of science journalism, partly because of perennial financial concerns, and acted mainly as a lunch group at which scientific journalists and scientists could meet. However, individual ABSW members had much success, especially those who were willing and able to demonstrate their expertise in, and commitment to, science journalism.[108]

The problem for editors and publishers was exactly how to find or mould those science writers willing and able to demonstrate their expertise in and commitment to science journalism. At the *Guardian*, for example, Crowther's departure in 1949 meant that editor AP Wadsworth did not have a member of staff who specialised in producing valuable scientific copy. For the more routine science news, such as the annual BA meeting, Wadsworth assigned members of the general news reporting staff.[109] This echoed Calder's entry into science writing and provided a glimpse of the future development of the profession. For the more complex and less public science news, general reporters were neither expert enough in science and presenting science in the print media nor enjoyed the same access to scientific experts as science writers. Wadsworth was, thus, forced to rely on scientist-popularisers, just as editors and publishers had before the science writer identity was established. Wadsworth's local contact, Jodrell Bank Director Bernard Lovell, was a regular contributor, for example, often exchanging publicity for the telescope project for exclusive scientific copy, as with a potential scoop on a new Soviet

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[106] *Nature* 26 Oct 1946 p. 579 and 26 May 1951 pp. 840-841. *BMJ* 5 July 1969 p. 61.

[107] *SxMs29* Box 85: Huxley to Crowther 22 Sept 1947, Minutes 6 Oct 1947, Summary Report 7 Oct 1947, Recommendations 9 Oct 1947.

[108] Science writers such as Derek Wragge Morley (*Financial Times*), Ben Boltz (of the BBC and later the *Financial Times*), John Davy (*Observer*), Ronnie Bedford (*Daily Mirror*), Harry Chapman-Pincher (*Daily Express*), Stubbs Walker (*News Chronicle*), Tom Margerison (*New Scientist and Sunday Times*), Trevor Williams (*Endeavour*), John Maddox (*Guardian* and *Nature*), Tony Smith (*Daily Telegraph*), and Leonard Beaton (*Daily Telegraph*) all joined up over the next decade or so. They were joined by science broadcasters such as Rosemary Jellis and Archie Clow, who created the 'science talks' section of the BBC, and amateur- or scientist-popularisers such as Patrick Moore and Arthur C Clarke, as well as Sir Francis Simon, a professor of thermodynamics at Oxford University, who wrote for the *Financial Times* from 1947 to 1952.

[109] *SxMs29* Box 129: Crowther to Wadsworth 13 June 1949.

cosmological theory.[110] Allowing expert-contributors to address audiences unmediated was resented as a challenge to the professional identity and expertise of journalists even more than having a partisan science writer on the staff.[111] Quickly, though, editors and publishers realised that the authority and prestige of scientist-popularisers did not outweigh their deficiencies in terms of being even less willing and able to demonstrate their expertise in presenting science in the print media for mass lay readers than scientific journalists. As Wadsworth put it, scientist-publicists were, on the whole, poor writers with little sense of what the public wanted to know and should know.[112]

In order to be able to cover the science beat on their own terms, *Guardian* editors began an active search for a science writer who could and would act as a science journalist and provide prestigious copy that would attract and sustain readers, as well as advertising.[113] In November 1952, Wadsworth and his senior staff resolved that, despite having few resources spare to allocate to the specialist beats, the *Guardian*'s scientific staff could be "strengthened".[114] Almost contemporaneously, a publishing agent alerted Wadsworth to the potential of Dr Trevor Williams, who was deputy editor of the quarterly scientific journal *Endeavour*, as a print media science specialist.[115] Wadsworth, however, did not view Williams as the solution to the *Guardian*'s science journalism vacancy. Wadsworth viewed Williams as a science writer in the mould of Crowther as a scientific journalist. Williams, like Crowther before him with Scott, sought to demonstrate to Wadsworth his expertise in both science and in the print media, but especially emphasising his experience in the technical press.[116] Wadsworth appointed Williams as Science Correspondent of the *Guardian* in the new year of 1953 with the hope that he would become a journalist specialising in science.

The change from Crowther's occupational title of Scientific Correspondent is significant and embodies Wadsworth's expectation that Williams would act as a science journalist rather than scientific journalist. Williams was, thus, charged with reporting on science rather than promoting it. In return for accepting these terms, Williams received more

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[110] *JRUL SC MGA* ECBS: B/L296/1: Lovell to Wadsworth 29 Nov 1949, Wadsworth to Blackett 15 Feb 1951; File GDN/149: Lovell to Wadsworth 6 Nov 1950, Wadsworth to Lovell 14 Dec 1951, Lovell to Wadsworth 18 Dec 1951, Wadsworth to Lovell 11 Feb 1952.
For example: *The Manchester Guardian* 18 Nov 1954.

[111] J L'Etang (2004): 56, 90-91, 112-113.

[112] *JRUL SC MGA* ECBS: Wadsworth to Slessor 8 Oct 1952.

[113] *JRUL SC MGA* GDN/223/8/1-202: Survey of Industry 1955, 24 June 1954.

[114] *JRUL SC MGA* File GDN/223/8/1-202: Note on Editorial Development 19 Nov 1952.

[115] *JRUL SC MGA* ECBS: B/W263B/1-25: Jean Le Roy to Wadsworth 24 Oct 1952; Wadsworth to Le Roy 18 Nov 1952; Le Roy to Wadsworth 2 Jan 1953.

[116] *JRUL SC MGA* ECBS: B/W263B/1-25: Williams to Wadsworth 20 Dec 1952, Williams to Wadsworth 16 Mar 1954, Wadsworth to Williams 21 Mar 1954.

support and reward compared to that of Crowther.[117] In addition, Williams received a boost in status within the newspaper office because his professional identity no longer clashed with that of his fellow reporters. However, Williams found it difficult to report science news as a specialist staff journalist rather than acting as a form of science editor. He returned to *Endeavour*, as well as the chairmanship of the ABSW, in the autumn of 1954.[118] Similarly, in the autumn of the following year, Ritchie Calder withdrew from his position at the *Chronicle*, appreciating that his editors wanted a committed full time science correspondent rather than a science "pontificator".[119] Like Haslett and Crowther before, Calder felt that editors and publishers had failed to appreciate the importance of science writers, from the "bright lights" of scientist-popularisers such as Jeans and Eddington to scientific journalists like Williams.[120] Calder also increasingly turned to media channels that allowed scientific journalists more production influence, especially broadcasting. It was now evident that being a science writer required more than simply understanding science and understanding the media. Science journalism required expertise in acting as a specialist industry resource that could attract readers with science news without attracting the ire of the scientific community.

For Wadsworth and the *Guardian* editors, the pool of possible science writer replacements for Williams was increasing as more writers were drawn to the profession. Editors and publishers were able to choose from numerous eager applicants those who promised the most potential in conforming to their conception of science writers. For example, freelance science writers Angela Croome and John Hillaby frequently contributed articles to the *Guardian* and approached Wadsworth and his fellow editorial executives seeking to be the newspaper's official science specialist.[121] From the potential candidates, in early 1955 Wadsworth selected John Maddox, another researcher-turned-journalist who was able to commit full time to staff science journalism.[122] Maddox had previously contributed freelance articles to the *Guardian*, and therefore understood the conception of editors and publishers of science journalism as a source of valuable copy with which to compete for readers. In fact, Maddox was eager to contribute news as well as leaders on science. It was his embrace of science journalism that led to Maddox becoming one of the most respected and sought after science journalists of his time. For example, print media proprietors and executives, such as Donald Tyerman of the *Economist* and Percy Cudlipp of *New Scientist*,

[117] *JRUL SC MGA* ECBS: B/W263B/1-25: Wadsworth to Williams 6 Jan 1953, Williams to Wadsworth 10 Jan 1953, Williams to Wadsworth 13 Jan 1953, Wadsworth to Williams 13 Jan 1953.

[118] *JRUL SC MGA* ECBS: B/W263B/1-25: Williams to Wadsworth 24 Apr 1955.

[119] *NLS MC RCA* Acc. 12533/6: Calder to 'Mike' 18 Sept 1955.

[120] *NLS MC RCA* Acc. 10318/60: *World's Press News* 13 Feb 1959; Dep. 370/100: Undated notes.

[121] *JRUL SC MGA* ECDS: D/1975/1-2: Croome to Wadsworth 5 Nov 1952, Wadsworth to Croome 10 Nov 1952; D/1846/1-46: Monkhouse to Hillaby 13 June 1956. ECBS: Croome to Wadsworth 31 Mar 1954.

[122] *JRUL SC MGA* ECBS: Maddox to Wadsworth 8 Mar 1955, Wadsworth to Maddox 9 Mar 1955; B/W263B/1-25: Wadsworth to Williams 20 Apr 1955.

both recent editorial appointees, courted Maddox's services as part of their plans to develop their publications. Wadsworth was understandably keen to retain the exclusive services of Maddox whose expertise in presenting science in newspapers made readers consider the *Guardian*'s scientific coverage of the "highest standards".[123] Deputy editor Patrick Monkhouse explicitly admitted that Maddox, as science correspondent, was a resource in the *Guardian*'s small arsenal of specialist staff with which they hoped to compete for mass readers.[124] Maddox was particularly valuable because his expertise allowed the *Guardian* to compete in terms of science coverage with other newspapers that were able to allocate more extensive resources to the beat. The *Financial Times* and *Daily Telegraph* employed more extensive specialist science staff, but it was the *Times* which invested most heavily in seeking to secure a reputation for breaking scientific exclusives.[125]

Maddox was one of the first science writers to recognise that editors and publishers controlled the employment terms and, thus, access to audiences through their media platforms. To access these platforms required science writers to foreground their loyalty to, and expertise in, the print media. Acting as a science journalist meant that practitioners were subject to editorial whim. This was a problem for those hoping to act as scientific journalists, but even more of a concern to the scientific community that began to more actively construct the 'problem' of science in the media identified by BIS Fellows. Now, even the sympathies of science writers could not be relied upon to produce positive popular representations of science. The deference of production influence to scientific experts was also lessening as journalists became less dependent on their sources. Scientists blaming the media became more commonplace, especially journalists. For example, RH Dobson, Managing Director of the aeronautical and astronautical engineering company AV Roe, complained of maltreatment, but Wadsworth largely dismissed his concerns.[126] Editors and publishers only remained concerned with instances of scientific inaccuracy, preferring appointees, such as Maddox, who had undertaken some science training, in order to avoid justifiable criticism from specialists of instances of factually erroneous reporting. Encouraged by the ABSW, many scientists turned to media management techniques and relatively unmediated channels, such as popular books, to directly address audiences with selected messages that reinforced the social authority of science. Such efforts, as with press releases and books marking the 1956 Royal Society International Geophysical Year (IGY) Antarctic expeditions, it was hoped would help lay

[123] *JRUL SC MGA* File GDN/149: DJ Davis to Wadsworth 22 July 1956.

[124] *JRUL SC MGA* ECDS: D/2847/1-13: Maddox to Monkhouse undated, Monkhouse to Maddox 10 Oct 1956.

[125] *JRUL SC MGA* ECDS: D/1846/1-46: Hillaby to Monkhouse 26 Nov 1956; D/2794/1-25: Monkhouse to Evans 20 Nov 1955, Martin to Maddox 9 Jan 1956, Monkhouse to Martin 10 Jan 1956, Martin to Monkhouse 23 Jan 1956, Monkhouse to Martin 7 June 1956.

[126] *JRUL SC MGA* ECBS: B/R203/1-6: Dobson to Wadsworth 9 Dec 1954.

readers "sort fact and well-founded conjecture from journalistic fancy".[127] In practice, print media professionals resisted such PR efforts, and both scientist-popularisers and scientific journalists were marginalised from the production arena.

The science writer identity now required commitment to and expertise in science journalism. In the space age, popular scientific copy became an even more valuable resource with which print media executives and proprietors sought to compete for readers. As a consequence, science writers whose professional identity aligned with science journalism became invaluable resources. Many science journalists, however, believed they were irreplaceable and allowed their scientific susceptibilities to surface. Their partisanship to science was a conflict of interest in press offices. In response, editors and publishers began to encourage general reporters to specialise in the science beat. It was hoped that such lateral shifts, combined with an absence of science training among practitioners, would, finally, produce science journalists who were both committed to and expert in presenting science news to mass lay readers. Traditional science journalists developed a siege mentality to resist this trend and protect their beat. In doing so, they revealed that they were not true journalists specialising in science as an industry resource. They felt they were specialists in media science when editors and publishers wanted specialists in the media. The identity of science writers was, thus, far from formalised or institutionalised, and soon became marginalised.

Print media popular science in the space age: Science writers are not science journalists

For print media proprietors, Sputnik reinforced their conviction that readers were increasingly and intensely interested in news of the role of science in public affairs, as presaged by the IGY. For example, the *Times*, *Telegraph* and *Guardian* all sought exclusive contributions from the Royal Society Antarctic expedition.[128] In the popular science magazine marketplace, public demand for space science material secured the future of *New Scientist*.[129] For editors and publishers, then, popular space scientific copy was now

[127] *JRUL SC JBA* CS2/5/1: Bizony to Lovell 5 Jan 1956. *JRUL SC MGA* ECDS: D/2794/1-25: Press release on the establishment of Halley station 21 March 1956.

[128] *JRUL SC MGA* ECDS: D/1846/1-46: Hillaby to Monkhouse 26 Nov 1956; D/2794/1-25: Monkhouse to Evans 20 Nov 1955, Martin to Maddox 9 Jan 1956, Monkhouse to Martin 10 Jan 1956, Martin to Monkhouse 23 Jan 1956, Monkhouse to Martin 7 June 1956.

[129] *ABSW Archive*: Misc. *Science Reporter*: July 1986. *New Scientist* 24 Nov 1966. P Wright and N Morrison (1997): Extract from Nigel Calder's keynote address, *The Right Stuff*.

an invaluable resource, even in the more sensationalist tabloid press.[130] The *Daily Mirror*, for example, offered extensive coverage of the opening of the space age. Science journalists, due to their expertise in producing copy for lay readers on this increasingly important aspect of public affairs, thus, also became invaluable print media resource.

From 1957, reporting science news was a means for print media executives and proprietors to counter the drift of readers to broadcast journalism.[131] Editors and publishers were increasingly accountable to readership figures. Audience surveys often pointed to the popularity of, and demand for, science copy, such as Maddox's science pages in the *Guardian*.[132] For the majority of the early space race, science writers enjoyed a special status, conferred by their interactions with three actor groups: the public demanded their work, scientists trusted them, and their colleagues and executives in print media offices called on them for advice, provided them with more latitude and judged them by their own standards.[133]

As the status and value of science journalism expertise increased, so did the opportunities available to its practitioners, and the science beat became a sought-after assignment.[134]. The tabloid *Daily Mirror* was one of the first to mirror the broadsheet newspapers in recruiting specialists in reporting science. It was Ronald Bedford, Science Editor, and Arthur Smith, Science Reporter, who oversaw the *Space Mirror* coverage of the aftermath of Sputnik.[135] Much of the early success of *New Scientist*, besides the interest aroused by Sputnik, was the policy of its editor Percy Cudlipp that its staff would adhere mainly to the "tradition of British weekly journalism" rather than the norms of popularisation.[136] Those science writers who were most expert in reporting and commenting on science and science policy were especially sought after. The editors of numerous publications, including Cudlipp who approached him to join the fledgling staff of *New Scientist*, courted John Maddox, Science Correspondent of the *Guardian*, for example.[137] In addition, the increased importance of science to public affairs meant that specialist science reporters were, now, of added value as producers of copy on a prominent, specialist cultural issue, especially at newspapers such as the *Guardian* whose policies committed their editors and journalists to covering the diverse interests among their readerships.[138] For example,

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[130] D Seymour and E Seymour (2003): Introduction, and years 1957, 1961, 1962, 1969 and 1971. See also: D Seymour (2011).

[131] C Seymour-Ure (1996): 138-178.

[132] *JRUL SC MGA* ECCS: C4/A26/1-47: Hetherington to WMcM 12 Jan 1961.

[133] JC Burnham (1987): 194-200.

[134] H Krieghbaum (1968): 65-81, 125-143.

[135] *ABSW Archive*: Misc. *Science Reporter*: Oct 1999, Nov 1999.

[136] *ABSW Archive*: Misc. *Science Reporter*: July 1986. *New Scientist* 24 Nov 1966.

[137] *JRUL SC MGA* ECCS: C1/M2/1-79: Maddox to Hetherington undated.

[138] *JRUL SC MGA* ECCS: C4/A17/1-38: Hetherington to Scott 25 Nov 1962.

Maddox was later commissioned by the *Guardian*'s new editor Alastair Hetherington to contribute a critique of space-age science policy and research to the summer and autumn 1963 leader series on 'Modernising Britain' in the run-up to a general election.[139]

The popular demand for science copy meant that the specialist services of science writers afforded them significant bargaining power in negotiating with print media executives and proprietors. In the early 1960s Maddox was able to persuade Hetherington to allow him to go on an extended trip to the US, including a tour of the US space establishments searching for newsworthy stories, even though he would not be able to supply regular copy. Editors and publishers recognised that the scope of science was now global, but, more significantly, that the best science journalists were almost irreplaceable. Hetherington agreed to Maddox's trip, for example, because even his irregular contributions were better than they were able to get from other writers. Maddox had arranged for Ken Owen, their occasional aerospace correspondent from the leading aviation journal *Flight*, to cover as much of the space field as he could, being the most important contemporary field, in his absence. Maddox also arranged for Nigel Calder, a science writer at the *New Scientist* and scientific journalist in the mould of his father, Ritchie, to act as the *Guardian*'s interim Science Correspondent to interpret important stories such as the rivalry between Fred Hoyle and Martin Ryle over competing theories of the origin of the universe. Maddox also felt that Calder could temper Owen's articles which he expected to potentially advocate for a 'Briton on the Moon'. In addition, *Guardian* general reporter Michael Coley-Smith was tasked with acting as "a kind of science legman" for the news editors to cover the routine science beat. Yet, the tripartite arrangement did not work well as a substitute for the work of Maddox as a science journalist. Maddox suggested alternative recruits such as Tony Osman, assistant editor of *Endeavour*, or Kim Johnson at the *Telegraph*, but Hetherington instead gave the keen David Davies from their Features staff, who had some scientific and medical training, a run as temporary "science reporter". Davies quickly moved on to *New Scientist*, and would go on to succeed Maddox as editor of *Nature*, and Ian Low from the *Guardian*'s general reporting office was then allocated to the paper's science beat. It is no surprise, then, that Hetherington was "more than happy" to see Maddox return to full time Science Correspondent duties. Press executives like Hetherington were, thus, vulnerable to the demands of exceptional science writers like Maddox for improved remuneration.[140]

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[139] *JRUL SC MGA* ECCS: C4/B25/1-31: Monkhouse to Hetherington 18 June 1963, *A New Britain*.

[140] *JRUL SC MGA* ECCS: C1/M2/1-79: Maddox to Hetherington 13 March 1962, Hetherington to Maddox 14 Mar 1962, Maddox to Hetherington Wednesday, Hetherington to Maddox 22 Oct 1962, Maddox to Hetherington 25 Oct 1962, Hetherington to Maddox 29 Oct 1962, Hetherington internal memo 29 Oct 1962, Maddox to Hetherington 28 Jan 1963, Maddox to Hetherington 7 Feb 1963, Maddox to Hetherington 5 Mar 1963, Maddox to Hetherington 26 Apr 1963, Hetherington to Maddox 2 May 1963, Maddox to Hetherington 17 May 1963, Maddox to Hetherington 6 Aug 1963, Hetherington cable to Maddox, Maddox to Hetherington 18 Sept 1963, Hetherington to Maddox 19 Sept 1963, Hetherington to Maddox 4 Oct 1963, Maddox to Hetherington 24 Oct 1963, Hetherington to Maddox 30 Oct

However, many newspapers like the *Guardian* struggled to allocate extensive resources to specialist beats, especially in comparison with the *Times*, which was able to strike up a science news service with *Nature* in 1966 through Haslett.[141]

The knowledge that their expertise was irreplaceable encouraged science writers to renegotiate their authority and identity with editors and producers. Maddox, for example, sought to become the *Guardian*'s science editor, a role in which he would coordinate and write all of the newspaper's scientific copy. Maddox was able to persuade Hetherington to appoint a supplementary staff reporter ostensibly so that he could avoid a "good deal of rushing about" in covering the routine science news beat. Low, Coley-Smith, and Davies from the *Guardian*'s general news staff variously fulfilled this role, now, even when Maddox was 'in residence'. In these appointments Maddox was able to influence Hetherington to appoint candidates whose journalistic experience outweighed their scientific competence.[142] In the process, despite the potential for the lack of science expertise among the science 'leg men' impacting on coverage, Maddox was implicitly ensuring that he was the only member of the *Guardian*'s staff with both scientific and print media expertise. In addition, science writers such as Maddox sought editorial approval to concentrate more on writing high-profile science policy leaders and science page features than reporting science news.[143] In such renegotiations with print media executives and proprietors, science writers were bargaining to be able to once again foreground their commitment to and expertise in science and popularisation and practise scientific journalism rather than science journalism.[144]

Of course, editors and publishers were accountable to the interests of audiences. Therefore, print media executives and proprietors did not allow their staff science specialists to extensively practice scientific journalism that served the interests of science. Hetherington, for example, insisted that Maddox cover the annual BA meeting, an event Maddox considered mundane, but which he knew that Hetherington viewed as a means of "bringing the paper to the attention of a captive and largely sympathetic audience".[145] On another occasion, Hetherington asserted that Maddox was ultimately answerable to the *Guardian*'s readers by instructing him to rectify complaints over deficiencies in their science coverage, such as the lack of publication of satellite orbits,

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1963 and 31 Oct 1963, Maddox to Hetherington 29 Dec 1963, undated notes by Whewell, Hetherington to Maddox 30 Dec 1963, Anon internal memo, Hetherington to Maddox 12 Feb 1964, Maddox to Hetherington 17 Feb 1964, Maddox to Hetherington 5 May 1964.

[141] *JRUL SC MGA* ECCS: C1/M2/1-79: Disagreement with 'Miscellany', Hetherington to Maddox 14 Sept 1967, *Nature* 16 Sept 1967, Maddox to Hetherington 18 Sept 1967, Tucker to Hetherington 21 Sept 1967.

[142] *Op. cit.*, fn 139.

[143] *Ibid.*

[144] Franklin, *op. cit.*, pp. 150-155.

[145] *JRUL SC MGA* ECCS: C1/M2/1-79: Maddox to Hetherington Wednesday.

compared to their rival quality newspapers such as the *Telegraph*.[146] In addition, Deputy Editor Patrick Monkhouse pointed Maddox to the work of Harry Chapman-Pincher (who wrote under the name of Chapman Pincher) of the *Express* in uncovering exclusive evidence that the Soviets were ahead in the space race as illustrative of the kind of material they considered ideal, even though challenging science was antithetical to Maddox's personal philosophy.[147] Hetherington also encouraged staff general reporters and specialist writers in related fields to contribute to the *Guardian*'s science journalism output, for example Ken Owen and Cold War Diplomatic and Defence Correspondent Leonard Beaton. Maddox sought to assert his priority, especially in the leader columns, arguing to Hetherington that the lack of scientific expertise of such colleagues could result in irresponsible coverage, as with Beaton on the 'dangers' of satellite bombers, or another "gee-whizz" article on a Jodrell Bank telescope project that could potentially lose good will among scientists.[148] Hetherington, on the other hand, asserted that science journalism was subject to the same news culture constraints as any other news reporting specialism, including unrelenting deadlines, and that readers judgments and opinions would be what editors' responded to in forming science beat policy.[149] Tensions were, thus, resurfacing between editors and science writers over the conception of and professional authority over science journalism.

ABSW-member scientific journalists remained a significant proportion of the science writer population, often motivated by a widespread concern with space age science and experienced in producing both news and interpretative copy. Calder, for example, argued in the *Times* that Britain should not be stampeded into the space race because it would be a "*folie de grandeur*", the country having neither the means nor the manpower to engage in a propaganda battle.[150] Calder also won the 1960 Unesco Kalinga Prize for the popularisation of science, then the world's highest independent honour for science writing – not science journalism.[151] However, print media editors and publishers increasingly asserted that scientific journalism was a link with an earlier tradition of science writing that sought to serve the interests of science, and incompatible with their conception of a science reporting beat that sought to appeal to the interests and demands of readers.[152]

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[146] *JRUL SC MGA* ECDS: D/1251/1-3: Tyrell to Hetherington 1 June 1961, Monkhouse to CI Pedersen (DSIR Press Officer) 4 June 1961, Pedersen to Monkhouse 7 June 1961; ECCS: C1/M2/1-79: Maddox to Hetherington 17 May 1963; ECCS: C1/T8/1-40: Tucker to Ratcliffe 19 Jan 1966, Tucker to various 19 Jan 1966.

[147] *JRUL SC MGA* ECCS: C4/B10/1-155: Beaton to Hetherington undated.

[148] JRUL SC MGA ECCS: C1/B4/1-146: Hetherington to Beaton 8 Oct 1959; ECCS: C1/M2/1-79: Maddox to Hetherington 29 Dec 1963; ECDS: D/2847/1-13: Maddox to Monkhouse 23 March 1962, Monkhouse to Maddox 26 March 1962.

[149] *JRUL SC MGA* ECCS: C1/M2/1-79: undated notes by Whewell, Hetherington to Maddox 30 Dec 1963.

[150] *The Times* 27 Jan 1959 p. 9 col. F.

[151] *NLS MC RCA* Dep. 370/2: acceptance speech; Acc. 12533/9: Calder to John Boyd-Orr 9 Mar 1961.

[152] *SxMs29* Box 177: Calder to Crowther 8 July 1956, Calder to Crowther 17 Feb 1957, Crowther to 'David' (publishing agent) undated; Box 258: John G Pattinson (publisher) to Crowther 15 Aug 1969.

Calder argued against the specialisation that was proceeding in science writing whereby science journalists were becoming overwhelmingly preoccupied with providing copy that would attract readers rather than critically engaging with the problems of science.[153] In addition, science writers were reluctant to engage critically with science policy in a way that could threaten their own privilege as political and social developments forced journalists of many kinds to deal with the environmental issues of science.[154] Media culture held production authority and science journalism was the identity in the ascendancy.

Editors' and publishers' encouragement of this specialist and science journalism ascendancy caused irreconcilable friction with those science writers seeking to institutionalise partisan scientific journalism. Nigel Calder, an occasional science writer contributor to the *Guardian*, found the "daily newspaper requirements" of science journalism both overwhelming and contrary to their motivations.[155] Ultimately, conflict with Hetherington over the motive and conception of science journalism resulted in Maddox's departure from the *Guardian* in April 1964, though he went on to much success as the editor of *Nature* from 1966, encouraging the journal to embrace both scientific and science journalism.[156] Hetherington was keen for Maddox to continue as a regular contributor of scientific copy but was not prepared to grant him the "freedom" to determine the policy and function of his role as the *Guardian*'s Science Correspondent.[157] Maddox urged Hetherington to choose a successor with significant research training and, thus, scientific expertise. Maddox argued for a recruit with this scientific expertise to avoid offending scientists with their coverage.[158] Maddox was advocating for a replacement who would harbour scientific sympathies and be more likely to act as a scientific journalist.

Editors and publishers, however, had an alternative strategy in mind to ensure that their specialist science writers would be partisan to the print media and readers and, thus, identify as science journalists. Print media executives and proprietors recognised that the problem of science writers was the susceptible and cosy relationships they enjoyed with their sources. The solution was to place faith in general reporters, with no entrenched

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[152] *NLS MC RCA* ACC. 10318/59: 'Science and the Public' 15 Jan 1969.

[153] JRUL SC MGA ECCS: C1/B4/1-146: Hetherington to Beaton 8 Oct 1959; ECDS: D/2847/1-13: Maddox to Monkhouse 23 March 1962, Monkhouse to Maddox 26 March 1962.

[154] Franklin, *op. cit.*, pp. 143-156.

[155] *JRUL SC MGA* ECCS: C1/M2/1-79: Hetherington to Maddox 22 Oct 1962. P Lyon (2010).

[156] *JRUL SC MGA* ECCS: C4/A31/1-274: various.

[157] *JRUL SC MGA* ECCS: C1/M2/1-79: Maddox to Hetherington 29 Aug 1964, Hetherington to Maddox 1 Sept 1964; C1/B4/1-146: Personal file 18 Dec 1962, Hetherington to Whewell 9 Jan 1966.

[158] *JRUL SC MGA* ECCS: C1/M2/1-79: Hetherington to Maddox 2 May 1963, Maddox to Hetherington 17 May 1963, Maddox to Hetherington 6 Aug 1963, Maddox to Hetherington 29 Dec 1963, undated notes by Whewell, Hetherington to Maddox 30 Dec 1963, Anon internal memo, Maddox to Hetherington 5 May 1964.

sympathies, to have the journalistic expertise to specialise in the science beat.[159] *Times* editor William Haley argued that Beaton proved that it was possible for any competent journalist to specialise in a reporting niche "if intelligent and energetic enough".[160] At the *Guardian*, Hetherington came to the same conclusion that journalistic expertise was most important and explored the possibility of laterally shifting one of his general staff into the science beat. Hetherington had recognised this possibility when general staff reporters had been enlisted to cover for Maddox's absences. In 1965, Phil Tucker, an experienced news and features reporter, succeeded Maddox as *Guardian* Science Correspondent. Tucker's appointment summarised the approach of media actors to the negotiations of the production of popular scientific material in the print media: the contribution of scientists or those with scientific susceptibilities was no longer acceptable or required. Editors and publishers hoped that such appointments would only result in practitioners who acted as journalists specialising in science.

However, the reality of Tucker's tenure echoed the wider tensions between science writers and print media editors; the scientific journalist identity was not easily overcome. There was a distinct discrepancy between how Tucker and Hetherington saw the identity and expertise of science writers. This discrepancy surfaced in regard to the contentious sub-editing of an article on 'satellite instrumentation' in 1966. Tucker, who had shown an interest in science, and had experienced some aeronautical training, was drawn to the science beat, and his affinity with science only increased with exposure during his routine work. In complaining over the editing of his article, Tucker admitted that he, too, now felt that the role of the science correspondent was primarily to write for "those who know the subject", and counted many *Guardian* readers as having this ability. Tucker had entered science writing as a science journalist though he soon came to affiliate with scientific journalism, including gaining the 1966 Glaxo-ABSW award for science writing as recognition of his popularisation efforts. In his speech accepting the award Tucker criticised the "non-scientific character of newspaper staffs" which hampered the science writer identity.[161] Hetherington, on the other hand, had instigated Tucker's move into the science beat to avoid exactly the problem of those expert in or sympathetic towards their specialisms being unable to write about them "without being a bore". Hetherington did concede that some scientific expertise was useful in avoiding ignorant errors that undid the benefit of exclusives.[162] Hetherington, and his fellow editor Pringle, also sympathised with Tucker's deference to sources on which he depended and appreciated and exploited

[159] S Dunwoody (2008): 15-18.

[160] P Lyon (2010).

[161] *JRUL SC MGA* ECCS: C1/T8/1-40: Hetherington to Tucker 30 May 1966, Hetherington to Tucker 1 Aug 1966, Tucker to Hetherington 31 Jan 1967, Hetherington to Tucker 1 Feb 1967.

[162] *JRUL SC MGA* ECCS: C1/T8/1-40: Hetherington to Tucker 30 May 1966.

the high regard with which his contributions were held among the scientific community.[163] However, both editors emphasised that Tucker was required, as *Guardian* Science Correspondent, to "make science intelligible" to the lay majority of their readership, and in service of their concerns and the news requirements of the paper.[164]

In response to the demands of print media executives and proprietors for science writers to act as science journalists, those who identified with the expertise of scientific journalism developed a form of siege mentality to preserve their identity. In particular, what Sharon Dunwoody calls the 'inner club' of science writing developed. The inner club emphasised collaboration in the science writing field which should have been characterised by competition, and was designed to allow science writers to set their own professional standards that had more to do with their own interests than those of the public.[165] The standards set mirrored those of the ABSW, in which the instinctive competitiveness of journalism was embodied in a durable sense of common purpose. This purpose, rewarded by the Glaxo awards, was to encourage the development and expansion of scientific journalism, and the accessible promotion of scientific advances to the public as sympathetic scribes.[166] The siege mentality to protect the identity and expertise of scientific journalists was not tenable in a production arena over which media culture held authority.

As a result of this siege mentality, scientific journalists were marginalised in newspaper offices and the science writers' partial monopoly over popular scientific material in the print media was broken.[167] Scholars note how science journalism can be identified as a niche specialism shaped by media culture in high-profile and fast-breaking news events.[168] In such events, the news agenda often moves beyond the scientific aspects and becomes the purview a wider range of journalists, and subject to the combative conventions of political journalism, with editors often only sanctioning science journalists to contribute a parsimonious amount of coverage.[169] If these analyses are correct, then, there is an argument to be made that science writers of the 1960s were not considered by print media editors as science journalists, because they were rarely even assigned to the background coverage of events such as the summer 1966 controversy surrounding the potential British withdrawal from the European Launcher Development Organisation (ELDO). The *Observer*

[163] *JRUL SC MGA* ECCS: C1/T8/1-40: Hetherington to CPD 13 Nov 1966.

[164] *JRUL SC MGA* ECCS: C1/T8/1-40: Pringle to Hetherington 24 Feb 1965, Tucker to Hetherington Thursday, Tucker to Pringle 25 Feb 1965, Pringle to Tucker, Tucker to Hetherington 20 Oct 1969, Hetherington to Tucker 21 Oct 1969.

[165] S Dunwoody (1986): 158-164.

[166] Wright and Morrison, *op. cit*.

[167] Burnham, *op. cit*.

[168] Gregory and Miller, *op. cit*., pp. 105-108.

[169] T Wilkie and E Graham (1998): 156-158. J Durant and N Lindsey (1998): 1-40.

argued in a leader before the crisis broke that the issue required public "scientific" discussion as well as economic and political.[170] Yet, the vast majority of the coverage of ELDO in the quality press – the *Observer*, *Times* and *Guardian* for example – focused on the issue as a foreign policy manoeuvre with the majority of articles and commentaries written by specialist political correspondents.

During the ELDO crisis, major science correspondents such as Tucker, Haslett and his deputy Science Reporter Pearce Wright at the *Times*, and even John Davy at the *Observer* whose leaders had issued the rallying call for scientific discussion of the matter, merely provided the background to the story. When articles by these science writers did appear, preceding or subsequent to the summer of 1966 height, their presentation was mostly in the form of space advocacy rather than space news.[171] Perhaps surprisingly, it was in the tabloid *Daily Mirror* that science journalists had the most extensive influence over the coverage of ELDO. This was largely because the matter was treated more contextually as a political and economic matter that would threaten sensational developments in space and because the newspaper's specialist political reporting staff was less strong. *Mirror* Science Reporter Arthur Smith shared his broadsheet colleagues' pro-space stance, with his partisanship less of an issue for his tabloid editors. However, the main reason why Smith was assigned to cover ELDO and his articles given prized column space was that he reported on the issue as a science policy matter.[172]

Smith was the only science writer who used ELDO as an opportunity to demonstrate his commitment to and expertise in reporting and commenting on science news for lay readers in the print media. That editors and publishers did not assign science writers priority even over the story of the moon landings suggests that the expertise and identity of the majority was not associated with the conception of science journalism. Science writers had created and abided by a professional identity that they felt offered both unique and necessary expertise in the production arena. In fact, editors and publishers, who held authority over the production arena, wanted science journalists rather than scientific journalists. Press publications are storytelling vehicles and trade in stories.[173] Because of this demand for stories, print media proprietors and executives wanted specialist science journalists who have a conception of their identity that ranks them in terms of foregrounding their expertise as journalists first, specialists second, and advocates third.[174] I argue that the marginalisation of scientific journalists forced the underlying

[170] *The Observer* 29 May1966, p. 8.

[171] See, for example: *The Observer* 19 June 1966 p. 12 and 25 Sept 1966 p. 4; *The Guardian* 29 Mar 1966 p. 8, 9 May 1966 p. 6, and 24 May 1966 p. 5; *The Times* 6 June 1966 p. 10 col. F; *The Times* 10 Aug 1966 p. 8 col. A.

[172] *Daily Mirror* 3 Jan 1966 p. 9 col. A, 6 June 1966 p. 28 col. A, 9 June 1966 p. 28 col. B, 10 June 1966 p. 28 col. C, 11 June 1966 p. 2 col. A, 8 July 1966 p. 24 col. A, and 15 Nov 1966 p. 28 col. E.

[173] T Radford (2007): 95-98.

[174] A Hansen (1994): 130-132.

'problem' scientists had with the media to the surface and that modern or 'true' science journalism did not emerge fully for another twenty years.

Conclusion

In this chapter, I have shown that media culture was coming to dominate the production of popular scientific representations with media professionals denying scientists influence over how these representations were constructed. For a time, the coalition between the science writers (and science broadcasters) and science establishment was effective in continuing to practice professional popularisation.[175] I argue that the breaking of this coalition by print media editors' and publishers' insistence that science writers act as science journalists, not scientific journalists, was the catalyst for the 'problem' of science in the media to turn from sporadic discontent among scientists into a political movement of the scientific establishment. One contemporary report edited by the space scientist Harrie Massey, for example, noted that science writers were in good company when they observed that "the communications of science are in an unsatisfactory state".[176]

The scientific community perceived the breaking of this coalition as a twofold problem, especially as popular ambivalence with science had spread even before *Apollo*. First, sympathetic scientific journalists were marginalised, preventing scientists from even indirectly addressing mass lay audiences. Secondly, those science writers who embraced science journalism were more likely to fuel this ambivalence and irreverentially challenge the social authority and value of science. In addition, print media executives and proprietors were beholden to audience demands and interests in their competition for readers. As a consequence the industry was inherently fickle, and science journalists were as much subject to fashion as any other specialist reporters.[177] For example, even before the moon landings Hetherington sought to remain supportive of Tucker as part of a commitment to "the right kind of *Guardian*" but admitted that routine scientific copy was now more of a luxury than a staple resource and one of the first niches to feel the squeeze when space got tight.[178]

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[175] Burnham, *op. cit*.

[176] PJ Farago (1976): Preface.

[177] Dunwoody, *op. cit.*, pp. 16-20.

[178] *JRUL SC MGA* ECCS: C1/T8/1-40: 8 Nov 1965 agenda for Hetherington, Hetherington editorial memo 18 May 1966, Tucker to Hetherington 31 Jan 1967, Hetherington to Tucker 1 Feb 1967, Hetherington to Tucker and JLS 27 Dec 1972; C4/A45/1-126: Hetherington editorial memo 10 Feb 1967.

The ABSW played a central pressure group role in the 'problem' movement that led to the construction of the Public Understanding of Science (PUS) movement in the 1980s and 1990s.[179] The ABSW, like many others, identified the root of the 'problem' in cultural clashes between the scientific and media communities in the production of mass media popular scientific material, especially in terms of conceptions of its motive and practice. However, science writers and their allies in the scientific community squarely placed the blame at the door of print media editors and publishers for embracing science journalism over scientific journalism. The ABSW, and the likes of Crowther and Tucker, pointed to the "clash between scientific and social values as reflected in media proprietors" that prevented their support for the popularisation of science.[180] However, the production authority of print media culture was dominant enough to resist this attempt to renegotiate control of the production arena. Science writers were, thus, a bridge across territories and a source of conflict between them, simultaneously dismantling and reinforcing the professional barriers in the contested arena.

By the late 1980s and 1990s many ABSW members argued to the Council that the perception and function of science writers as the "PR arm for science" was alienating the support of editors and publishers. After much contested discussion of the professional role of science writers, Council members eventually resolved that the ABSW would encourage its members to become "constructive critics" rather than mere translators and conduits for the scientific community.[181] In this sense, science writers finally agreed to identify with the conception of editors and publishers of science journalists as reporters who reported science in the same way that sport and political correspondents reported their subjects rather than as missionaries.[182] A 1998 ABSW *Newsletter* review of Gregory and Miller's *Science in Public* agreed with the book's analysis that "science journalism is much more about journalism than it is about science", and that the function of science writers, now, was to produce popular scientific material that was consumed by readers.[183] Yet, many science writers remain drawn to the profession because they like science and because of the prestige associated with being a science writer.[184] As a consequence, many science writers still identify closely with scientists and are susceptible to adopting their attitudes and the identity of scientific journalists, often retailing science more than challenging it.[185] Tensions, thus, remain in production arena negotiations.

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[179] For more on the 1970s 'problem' of science in the media see: BAAS (1976): esp. p. 2. For more on the Public Understanding of Science (PUS) movement this spawned see: J Gregory and S Miller (1998): esp. Preface and Chapter 1.

[180] *ABSW Archive*: Misc.: 2 May 1985; Misc. Science Reporter: May 1995.

[181] *ABSW Archive*: Misc. *Science Reporter*: EUSJA Summer 1989, Feb 2000; Meetings 1998-2001: 15 Jan 2003.

[182] M Shortland and J Gregory (1991): 12-19.

[183] *ABSW Archive*: Misc.: report by Newton 17 Dec 1990; Misc. *Science Reporter*: June 1999.

[184] Franklin, *op. cit.*, pp. 149-155.

[185] Nelkin, *op. cit.*, pp. 170-182.

As Chiara Palmerini notes, science writing is a process of dual negotiation. Scholars often focus on the relationships between journalists and their sources. However, just as important, if not more so, are the interactions inside the news office between science journalists and general editors.[186] The development of science was a prolonged and complex process of negotiation in the production arena. Science writers took advantage of a gap in the arena for a profession to supply mass audiences demanding popular scientific material. They negotiated with both the scientific and media communities, and created the intercultural identity of scientific journalists with expertise in both science and popularisation and the media and lay writing. However, editors and publishers extended their authority over the production arena, and limited access to platforms to those who could and would commit to, and were expert in, presenting science popularly in the print media in a way that would attract mass lay readers. The required professional science-mediating identity in the production arena had shifted from science publicists to science reporters. In the next chapter I explore the development of science broadcasters. The different technology of broadcast media meant that the broadcast science production arena had different rules to that of science writing. Compared to science writers, science broadcasters – that is, those producers who specialised in science programming – had to foreground their expertise in entertaining viewers and listeners much more quickly and forcefully. As a consequence, science broadcasters became key resources in the competition for broadcast audiences. The development of science broadcasting was, thus, very much a process of negotiation within media culture in comparison.

[186] C Palmerini (2007): 113-114.

Chapter Four

"Entertaining, interesting and responsible": The development of science broadcasting in the BBC

Science broadcasters developed in a markedly different fashion from the evolution of science writers described in the previous chapter. The dissimilarities of development largely stem from the fact that the mechanics of the production arena for science broadcasters were different from those for science writers. The exacting audio and visual techniques of the broadcasting medium were difficult for media professionals, scientists, and science-mediating specialists to adapt to compared to the long-established traditions of the print media.[1] These challenges impacted directly upon negotiations in the science broadcasting production arena. It became clear that expertise in broadcasting was vital for those involved in producing scientific programmes that would attract mass audiences. Media culture, thus, quickly extended its authority over the common arena. As a consequence, much of the professional development of science broadcasters was driven by the changes in, demands of, and negotiations within, this culture.

From the late 1920s to the late 1950s, the BBC dominated broadcasting in the UK. BBC executives and directors were committed to providing a culturally enhancing public service. However, three major developments influenced the culture of the BBC within this period: first, the emergence of overseas commercial radio competitors in the interwar years; second, the burgeoning of television in the early postwar years; thirdly, the breaking of the BBC's broadcasting monopoly by a national commercial television rival in 1954. These developments forced the BBC into competing to preserve their dominance and for the attention of mass audiences and, thus, meant that more focus had to be placed on entertaining viewers and listeners. The challenge for BBC controllers and producers was how to entertain audiences while still fulfilling their public service mandate.

Though these cultural changes in broadcasting concerned BBC executives, I argue that these changes favoured the development of science broadcasters. There was an increased need for programming that could be entertaining as well as educational and informational. Science broadcasters were able to exploit developments in both space science and in broadcasting production to demonstrate that programmes on science could fulfil this criterion. As the changes in broadcasting culture proceeded, science broadcasters became an ever more valuable resource, and their social identity in the production arena was

[1] MC LaFollette (2008): 1-5, 239-246.

cemented. The increased emphasis on entertaining audiences also meant that more value was placed on broadcasting technique in production negotiations. As a result, science broadcasters had to foreground their media partisanship at a much earlier stage in their development than science writers. This foregrounding meant that scientists were much more marginal to the negotiations of the development of science broadcasters. In addition, the importance of broadcasting technique meant that radio science broadcasters and television science broadcasters developed as independent specialisms.

Yet, in the early years of the British broadcasting industry, it was not clear that the development of science broadcasters was going to take this path. It was not even clear that science programming would play a role as a crucial resource in the elitist BBC constructed by Director-General John Reith. When science did appear in the schedules it was usually in the form of producers facilitating didactic lectures of eminent and authoritative scientific experts, such as the influential astronomer, James Jeans. However, from an early stage, it was recognised that the rules of science broadcasting were very different and much more challenging than those for science writing. In addition, as with science writing, audience demand for popular science was identified by producers. These factors combined to reveal the potential for a new specialist-mediating profession. The requirement to entertain audiences meant that the authority and social identity of science broadcasters quickly became determined by their expertise in broadcasting technique rather than science.

A conflict of expertise: Production negotiations in interwar science broadcasting

The British Broadcasting Company was formed in 1922 and, in 1927, became the British Broadcasting Corporation (BBC). The BBC was constructed as a public monopoly corporation, a compromise that sought to combine the best values of both public service and commercial broadcasting templates and models.[2] Its first Director-General, the Calvinist and paternalistic Scottish engineer John Reith, constructed its broadcasting policy around three tenets: education, information and entertainment. Of these tenets, Reith, who believed that radio programming could be a means of culturally improving the mass citizenry, favoured information and education.[3]

[2] A Crisell (2002): 19

[3] J Cain (1992): 10-19.

In this elitist notion, mirroring or reflecting wider society, science was initially marginal to the radio schedules, but became increasingly important following the revolutions in 'new physics'. On the occasions it did appear, science programming concentrated on informing and educating rather than entertaining listeners. Didactic lectures by, and discussions with, eminent scientific experts on subjects such as Einstein's relativity and the development of quantum theory were the programmatic norm. For example, science programmes included 'star talks' for amateur astronomers and the high-profile 'National Lectures' of the cosmologist Arthur Eddington and science fiction writer HG Wells in 1929. Especially popular was the 1930 *The Stars in their Courses* series by James Jeans. At this time, usually in the Talks department headed by Hilda Matheson, the role of BBC producers in science broadcasting was to commission and facilitate the occasional talk by a scientific authority who was allowed to directly popularise to mass audiences.[4] The programme makers were granting listeners the privilege of an audience with a scientist.

In the late 1920s and early 1930s, however, Talks producers emerged who began to specialise in science programming. The most prominent and prolific of these early science producers was the Cambridge-schooled biologist and adult educationist Mary Adams. Adams had delivered a series of talks on heredity as a guest speaker before moving behind the microphone to informally supervise the isolated science broadcasting staff at the BBC in 1929.[5] The main motivation, I argue, for certain broadcasters to seek to specialise in science programming in this period was the insufficient quantity, quality and audience appeal of existing science output. These deficiencies in science programmes were a product of the lack of expertise and resources dedicated to the genre by BBC executives. Early producers specialising in science programming such as Adams, I suggest, knew that the production of science broadcasting would have to change for two reasons. Firstly, if the BBC was to compete with the print media in exploiting the public demand for popular scientific material, especially following the increased investment of editors and publishers in science-mediating specialists. Secondly, if the BBC was to compete for listeners with the emerging commercial and entertainment-oriented overseas radio organisations such as Radio Luxembourg. It was at this time, I propose, with the growing social importance of science, that it was first recognised by science broadcasters that science programming could be portrayed as being of crucial value to the BBC. This value, the likes of Adams understood, lay in its ability to provide both cultural and popular output that would appeal to both listeners and the BBC's elitist hierarchy.

Compared to the emergence of science writers in the previous chapter, then, science broadcasters understood from the very outset that demonstrating their media expertise was more important than scientific expertise to forging a social identity in the production

[4] H Matheson (1933): 243-244.

[5] A Jones (2010): 3-5.

arena. The nature of broadcasting as a medium, at first aurally and orally, required distinct skill in broadcasting technique. By emphasising the importance of this technique, science producers aligned themselves with, and extended the authority of, media culture over the production arena.[6] In the process, they excluded scientists from production negotiations at a much earlier stage than for science writing, with the development of science broadcasting proceeding largely subject to developments within media culture. Though scientists would always remain crucial to science broadcasting as sources and contributors, the first stage in their exclusion from production influence began when producers started to regulate access to microphones and, thus, direct access to audiences.

In November 1927, JG Crowther, Scientific Correspondent for the *Manchester Guardian*, was commissioned by Matheson to present a series of peak-time 'Stars of the Month' talks, and to prepare a supplementary chart for the *Radio Times* edited by Walter Fuller and Eric Maschwitz. Previously, Crowther had not been able to convince Matheson, Fuller, and Maschwitz of the need for a *Radio Times* science page or BBC Science Bureau or Science Talks sub-department. However, this earlier approach had alerted Crowther's BBC contacts to his "special qualifications" as a specialist in both science and the media, and especially in presenting science to lay audiences.[7] When it came to commissioning a writer and speaker for the star talks, then, Crowther was fresh in Matheson's mind as a potential candidate who had certain skills more suited to their expository needs than existing, uninspiring expert-contributors. Crowther, like Adams, though a scientist by training, was experienced in presenting science in a way that appealed to mass lay audiences, and Matheson believed he had a "gift for making the stuff interesting".[8]

However, the arrangement was not without its problems. Despite praise from various listeners, there were complaints from eminent astronomers over "many inaccuracies" in the programmes, even though Frank Dyson, the Astronomer Royal, had checked the scripts.[9] More pressing were the conflicting priorities of Matheson and Crowther. Crowther was concerned with improving public understanding and appreciation of science and, like his early contributions to the *Manchester Guardian*, his broadcast scripts were often felt by producers to be unintelligible. Matheson, above all, was concerned with ensuring the talks were "beyond criticism" from the point of view of broadcasting technique and that they would attract a captive audience. Ultimately, Matheson discontinued the series in March 1928 on the advice of science producers such as Adams in the Talks division.[10]

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[6] S Dunwoody (2008): 20-22.

[7] *SxMs29* Box 149a: Matheson to Crowther 2 Mar 1927.

[8] *SxMs29* Box 149b: Matheson to Crowther 16 Nov 1927.

[9] *SxMs29* Box 6: Matheson to Crowther 13 Jan 1928; Box 149b: A Listener to Crowther 2 Jan 1928; Dyson to Crowther 18 Jan 1928.

[10] *SxMs29* Box 149b: Matheson to Crowther 22 Nov 1927; Matheson to Crowther 1 Dec 1927; Matheson to Crowther 6 Dec 1927; Box 6: Matheson to Crowther 13 Jan 1928; Matheson to Crowther 31 Feb 1928.

Crowther's trial showed broadcasters that it was not going to be straightforward to find or mould contributors that would help demonstrate both their mediating expertise and that science programming could be a valuable resource in competing for audiences but without compromising public service ideals. Crowther found it difficult to appreciate that the methods of approach to science and the handling of its themes are comparable across the media but that the nature of the medium imposes conventions on its presentation.[11] In the case of science broadcasting, expertise in these media conventions was crucial if science programming was to become a valuable resource. Crowther did not appreciate that the rules of the science broadcasting production arena were different. In late 1928, Crowther wrote to Matheson emphasising that his expository portfolio had expanded in the interim with the aim of regaining access to the broadcasting platform. However, Matheson preferred to revert to relying on the services of professional popularisers such as Jeans who had the rare distinction of being both authoritative and engagingly lucid.[12]

In 1930, though, the BBC hired the scientific humanist Gerald Heard as its first science commentator.[13] Heard, like the science writer Ritchie Calder, shared a journalist's concern with scientific progress, especially as manifested in the revolutionary political and economic crises of the 1930s. In his 1935 book *These Hurrying Years*, Heard used the principle of rocketry propulsion – "action and reaction are equal and opposite" – to argue that man could not advance outward to further knowledge of the universe unless he advanced complementarily and proportionately inward to deeper knowledge of himself.[14] As part of his philosophy, Heard ardently advocated and practiced explaining science popularly to the masses, and he believed that science, though difficult to understand, could be both interesting and entertaining especially if told by specialist science-mediators.[15] Apart from popular books, Heard wrote extensively in mostly left-leaning periodicals while also founding a short-lived magazine *The Realist—A Journal of Scientific Humanism*.[16] Later, he would contribute a summer 1936 column called 'The World: Brought to Your Armchair' for the *Daily Mirror* on subjects such as comets and sunspots as a "Famous Scientific Writer".[17] Yet, it was in broadcasting that he was to become most associated with expounding science popularly.

Heard was contracted at the instigation of Talks Editor Mary Adams. Building on her own experiences of delivering scientific talks, Adams sought out the most lucid and engaging

[11] G Jones et al. (1978): i.

[12] *SxMs29* Box 6: Matheson to Crowther 31 Feb 1928; Matheson to Crowther 13 Aug 1928; Box 125: Crowther to Matheson 8 Aug 1928.

[13] For more on Heard's background, see: R Hayward (2004) and A Falby (2008b).

[14] G Heard (1935a): 348-356.

[15] G Heard (1932): 7-34. G Heard (1937): 9-20.

[16] A Falby (2008a).

[17] *Daily Mirror* 9 May 1936 p. 13 and 9 June 1936 pp. 9 and 13.

commentators on science who embodied and portrayed the expertise of science producers. Heard's agricultural, historical and spiritual training placed him in a good position to comment on the implications of the quasi-philosophical scientific pronouncements of figures such as Jeans and Eddington. More important for Adams, Heard was an affable radio personality who attracted listeners. Compared to the experiment with Crowther, Heard was much more successful. Heard wrote and presented an extensive number of peak time popular science programmes such as *Research and Discovery* (later renamed *This Surprising World*), *Science in the Making*, and *Inquiring into the Unknown* over four years, until he left his post in 1934. Scientists became contributors to Heard's commentaries, rather than being lecturers.[18] Though Heard was not replaced, science talks became something of a staple of the schedules.

Heard allowed science producers such as Adams to demonstrate the value of science programming to the BBC as interesting, educational and entertaining output. In the process, Heard's tenure consolidated the professional identity of science broadcasters as producers who were expert in the broadcasting techniques of producing such valuable output, with Ian Cox succeeding Adams in a new Director of Science Talks role in 1936. However, the development of science broadcasting was not without its hurdles. In particular, following Heard's departure, Adams and Cox admitted they were finding it difficult to find "fine speakers capable of reporting seriously on the wide fields of science" apart from the likes of Jeans and Eddington, whom they were reluctant to employ in the quest to produce quality broadcasting output.[19] On one occasion, Talks Directors commissioned the ionospheric physicist Edward Appleton for a talk on sunspots only because he was the "best there is" of a poor selection of choices of speaker on the subject.[20] Of more pressing concern was the fact that many scientists had construed producers' influence over production as a 'problem'.

As Allan Jones notes in his study of science broadcasting in the 1930s BBC, there was both much conflict and collaboration between producers and expert contributors. Jones suggests, correctly I believe, that this clash was a product of a conflict of expertise. In my analysis it is clear that scientists' tradition of enjoying relatively direct access and influence over the messages to audiences had been challenged by producers who asserted their production authority in terms of stressing their broadcasting expertise. As Jones rightly claims, science producers such as Adams were primarily concerned with programmes that "worked" from a broadcast standpoint and attracted audiences.[21]

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[18] A Falby (2008a). See also: PJ Bowler (2009): esp. pp. 191-214.

[19] *BBC WAC* File R51/523/1: Adams to Cox June 1936, Cox to Rose-Trump 5 Aug 1936.

[20] *BBC WAC* File EVA 1a: internal memo 26 Jan 1937, Deputy Editor to Appleton 17 Feb 1939, DA Howarth to Appleton 30 Jan 1939.

[21] Jones, *op. cit.*, p. 8.

Certain scientists perceived their lack of production influence as a threat to their social expertise and their traditional cultural authority over the production of popular scientific representations. A certain amount of scientific community lobbying of BBC executives had led Director of Talks JM Rose-Trump to consult Henry Tizard, the well-known chemist and scientific administrator and populariser, for his advice on introducing scientific subjects to the public.[22] This form of political pressure would increase in the postwar years with the increased prevalence and importance of science and science broadcasting. A hint at debates to come was revealed by Cox in *Nature* when he sought to reassure scientists that science broadcasters, though media professionals, were committed to promoting science through topical talks series such as *Science Review*.[23] A certain amount of production influence was still assigned to scientific experts because of producers' source dependence.

The further development of science broadcasters was interrupted by the onset of war. Significant financial and administrative hurdles marked the war years for the Corporation, with many staff members, including Cox, seconded to the national effort. The interwar years saw the beginning of trends in BBC culture that would continue in the postwar period and continue to favour the production authority and identity science broadcasters. Of particular importance was the reluctant but increased emphasis placed on entertaining audiences by executives with the expansion of television. Alongside high profile developments in science itself, science programming became an even more valuable resource in terms of providing entertaining and culturally prestigious output for the BBC as a public service broadcaster. In the process, science broadcasters had to foreground their media loyalties and expertise even further which invited further confrontation with the scientific community. Ultimately, though, the professional identity and expertise of science broadcasters was reinforced, formalised and institutionalised.

Science on radio: The consolidation of science broadcasters

William Haley joined the BBC as its first Editor-in-Chief in 1943 and, in 1944, he succeeded Robert Foot as Director-General. Under Haley's direction BBC executives began planning BBC policy for when the war ended. With the status of both science and radio boosted by their active roles in the conflict, through radar and propaganda respectively, for example, a coalition of lobbyists from the scientific establishment sought to exploit the planning discussions for the postwar BBC to re-establish some measure of production influence over

[22] *BBC WAC* File R51/523/1: Rose-Trump to Adams 11 June 1936.

[23] *BBC WAC* File R51/523/2: *Nature* 22 July 1939.

science broadcasting.[24] This was the first political manifestation of the 'problem' of science in the broadcast media, defined as both scientists' increasingly negligible production influence and the increased pressure to demonstrate a loyalty to the concerns of the media of the specialist producers that claimed their production influence. In late 1943, four major institutions - the Royal Society, British Association (BA), British Council and Association of Scientific Workers – brought pressure to bear on BBC executives and directors through the government to establish an advisory or consultancy post or committee. A scientist or scientists was meant to occupy the post or committee whose remit would include some level of production oversight.[25] The aim of the lobbyists was to re-establish a more direct line of contact with audiences and exploit the power and reach of broadcasting as a medium for scientific propaganda.

To deflect the attention of the lobbyists approach, Haley ordered Home Service Controller Richard Maconachie to internally evaluate the BBC's science broadcasting organisation and to compose a response. Certain producers told Maconachie that it was possible to satisfy listener interest and promote British science. Other producers were adamant that the BBC could make a commitment to science broadcasting without the need for scientific experts to be integrated into the organisational structure. Following his survey, Maconachie reported to Haley that an advisory post or panel would be both ineffectual and unnecessary, given that producers already had informal "arrangements with the scientific institutions" and individual experts.[26] As a concession to the lobbying faction a Scientific Advisory Committee (SAC) was formed, but BBC executives constructed its terms of reference around technical developments in broadcasting rather than production oversight. The production authority of broadcasters and science broadcasters was, thus, reinforced in terms of their expertise in broadcasting science in a way that both attracted audiences and provided a public service. Science broadcasters, unlike boundary-spanner science writers, primarily demonstrated their commitment to and expertise in the broadcast media, though repeated approaches over the coming two decades from the scientific establishment ensured that producers sustained their scientific sympathies. As Robert Dingwall and Meryl Aldridge noted in their study of wildlife programming, science programming was a product of the balance between pressures on producers to contribute to the public understanding of science and to succeed in the broadcasting market.[27]

The professional identity of science broadcasters, however, was not fully established. At the end of the war, Ian Cox and Mary Adams resumed their roles as fledgling science

[24] A Briggs (1985): 243-257, 271.

[25] *BBC WAC* File R51/529: Maconachie to Haley 22 Dec 1943.

[26] *BBC WAC* File R6/288/1: Maconachie to Haley 13 Feb 1945, Undated note on 'advisory panel on scientific subjects'.

[27] R Dingwall and M Aldridge (2006): 147-148.

producers. Archie Clow, a popular historian of chemistry, was now a third producer specialising in science programming. Partly because of the lobbyists' challenges to their authority and partly because the postwar profile and prestige of science was such that audience demand for science on the radio was expected to increase, Cox, Adams and Clow sought to formalise and institutionalise science broadcasters as valuable specialist mediating resources. At a lecture given to the Royal Institute of Chemistry in October 1945, Clow sought to reassure the audience of scientific experts that science broadcasters were committed to building public understanding and appreciation of science. This statement had a second purpose. It was designed to ensure that BBC executives were aware that science programming could contribute to the information and education tenets of their public service mandate.[28] In the spring of 1946, Cox and Adams also sought to inform BBC executives such as Maurice Gorham, Controller of the new, less highbrow Light Programme, that science programming could be entertaining. Cox defined the professional science broadcaster as a "middleman".[29] Though this term is rather misrepresentative, Cox viewed the identity of science broadcasters as being defined by their expertise in broadcasting as a communication device, such that they could produce programmes that contained both science and scientists that were both popular and cultural.

The importance and value of science broadcasters as specialist industry resources was boosted by postwar popular demand for science programming. Science occupied a prominent place in technocratic plans to encourage a 'new Elizabethan age' in British society. Space science, in particular, stood out as becoming a showpiece discipline, especially with projects such as the 'spectacular' Jodrell Bank radio astronomy telescope.[30] Cox emphasised to Gorham that science on the radio should be a "foregone conclusion" if broadcasting was to continue the policy of reflecting and projecting subjects of importance and relevance to the audience's daily lives.[31] In particular, broadcasters sought to exploit the prevailing spirit of scientific nationalism pervading postwar Britain. Radio science producers such as Clow were able to stake a prime time claim for their programming, arguing to BBC executives that science talks, such as by the space scientist Edward Appleton on the development of radar, had both "high authority and general merits" to attract listeners.[32]

Science programming became a regular fixture in the radio schedules. Cox reported to Gorham that radio science comprised "news (of science matters), talks and features",

[28] *BBC WAC* File R51/523/4: Address 21 Oct 1945.

[29] *BBC WAC* File R51/523/5: Cox to Gorham 30 Apr 1946; File R51/529: notes by Cox and Adams.

[30] J Agar (1998).

[31] *BBC WAC* File R51/523/5: Cox to Gorham 30 Apr 1946.

[32] *BBC WAC* File EVA 1a: Hilton Brown to Godfrey Adams Aug 1945, Clow to Appleton 19 Mar 1946 and 24 Mar 1947.

often presented by eminent personalities.[33] The emphasis was firmly on talks, continuing the pre-war didactic lecture policy, and Clow formed the BBC Science Talks division. Astronomy, in particular, frequently formed the basis of scientific programming matter because of its significant amateur enthusiast audience.[34] From 1946, *The Night Sky* was a semi-popular semi-highbrow monthly show forming part of the weekly *Science Review* series on the Third Programme under Harman Grisewood. Dr George Porter, Fellow of the Royal Astronomical Society and President of the British Astronomical Association, presented most editions.[35] In the autumn of 1947, Clow worked with Jodrell Bank director Bernard Lovell to construct a talk around the radio astronomical confirmation of the cometary origins of meteors. Clow and Lovell cooperated again in 1952 in the production of a *Science Survey* programme marking the beginning of construction of the iconic Mark I (later Lovell) telescope at Jodrell Bank.[36] In addition, Christmas 1948 saw the inaugural Reith lecture designed to engage with significant contemporary issues. This lecture was delivered by the philosopher Bertrand Russell on *Authority and the Individual*, showing the value which science programming, in this instance applied to social reform, was coming to hold for broadcasters. In 1950, the astronomer and cosmologist Fred Hoyle became a household name with his *Nature of the Universe* talks, produced by science broadcasters Nesta Pain and Philip Daly. The following year, Arthur Garratt, who would become most associated with science broadcasting on the BBC World Service, extensively featured the scientific exhibition at the 1951 Festival of Britain, an arts and industrial showcase, on the highbrow Third Programme.[37]

It is significant that science on television was conspicuous by its absence in the early postwar years. Experimental science programming was not a staple of the BBC's Television Service that began in 1936, even though Adams was one of only four interwar television producers.[38] Neither was science programming a regular feature in the schedules of the visual service that resumed in June 1946 following its wartime suspension for defence reasons. By the end of the 1940s, the only dedicated programmes on science and technology in this medium were *A Question of Science* and *Inventor's Club* from April 1948. Jane Gregory and Steven Miller describe these early series as "uncomfortable viewing" compared to the later efforts of science broadcasters when they became more experienced and expert in producing visual scientific programmes.[39] Science programming and science broadcasters were not alone in their isolation from television. Television itself was isolated within the BBC's structure by executives who favoured and were experienced

[33] Cox to Gorham 30 Apr 1946, *op. cit*.

[34] PJ Bowler (2009): 264-276.

[35] For example, see: *BBC WAC* SFC: A&A.

[36] *BBC WAC* File BL 1: Clow to Lovell 14 Oct 1947, Lovell to Clow 19 Oct 1947, Clow to Lovell 23 Apr 1952.

[37] *ABSW Archive*: Misc. *Science Reporter*: Feb 1995.

[38] Jones, *op. cit.*, pp. 9-10.

[39] J Gregory and S Miller (1998): 41.

with radio, and who were wary of the tendency of producers and executives in the visual medium to focus on entertaining audiences.

Director-General Haley, certainly, felt that television was of secondary importance given the public service mandate and Reithian ideals of the BBC. Alongside his senior management ally Basil Nicolls, the Director of Home Sound Broadcasting, Haley oriented the organisation and resources of the BBC in such a way that its radio services would be developed. The Directors installed experienced radio-minded controllers in prominent executive positions. In September 1946, the Radio Service was expanded and diversified into three channels designed to be culturally enhancing for listeners: the domestic news-oriented Home Service, the more popular Light Programme and the highbrow Third Programme. Television was isolated as one of six 'radio' divisions of the Home Service rather than being treated as an independent and distinct broadcasting medium.[40] In this construction, as the science writer AW Haslett noted in 1947, the BBC's policy was to "carry on with the pre-war system as before". The same year, the Labour White Paper on the future of broadcasting barely mentioned television and, in 1948, when the BBC celebrated its Silver Jubilee, the medium played a minor role. However, Haslett also noted that the potential of the visual medium had been widely recognised.[41]

Haslett was largely prescient, here, as in the late 1940s and early 1950s the latent potential of television was released. BBC executives were forced to accord more importance to the visual medium, especially with pressure from commercially-minded politicians suggesting that not only would their broadcasting monopoly be broken but that their rival would be in competition for viewers rather than listeners. The same executives also had reluctantly to accept that more focus would, thus, have to be targeted towards entertaining the audience. These changes in broadcasting culture offered both challenges and opportunities to science broadcasters.

Some radio science broadcasters sought to shift laterally into television science. More, though, sought to emulate or counter the shift of audiences to television science programmes (and, later, to the BBC's national broadcasting organisational rival) by emphasising entertainment in radio science programming. Talks on astronautics and space exploration featuring the British Interplanetary Society, for example, placed less emphasis on education and information and sought to exploit popular enthusiasm for a space age future.[42] Radio producers also sought to present science in formats other than the didactic talk. The 1953 Light Programme *Journey Into Space* was a *Dan* Dare-esque interstellar

[40] For more on the organisational, cultural and policy primacy of radio in the BBC see: Briggs (1985), *op. cit*.

[41] AW Haslett (1947): 107-108.

[42] *BBC WAC* SFC: A: 25 Jan 1949; 29 May 1949; 18 Jan 1950.

radio drama-opera written by Charles Chilton of the BBC Variety department.[43] However, *Journey Into Space* was the last radio science programme to attract a bigger audience share than a television science programme, and radio producers were constrained in terms of viable formats and approaches for presenting scientific material to audiences by the nature of the audio medium. Subsequent programmes on certain scientific subjects could still attract significant numbers of listeners. Space science was one such subject, with Edward Appleton invited to deliver the prestigious 1956 Reith lectures on 'Science for its own Sake', with one talk in the series focusing on the work of Lovell and the radio astronomers at Jodrell Bank.[44]

Yet, science on television became of even more value than science on the radio because of its programmatic flexibility. Clow later wrote to the Board that radio science broadcasters had a surplus of science programmes because executives were less willing to allocate valuable schedule space to this sub genre.[45] The importance of television science lay in its ability to foreground didactic or entertaining aspects depending on the directives of executives. With broadcasting culture becoming ever more focused on entertaining audiences, science programming allowed producers to produce appealing television shows that inherently conformed to the BBC's public service remit. As the value of television science increased, so the professional science-mediating identity of television science broadcasters was reinforced at the expense of radio science broadcasters. Radio science gradually became a testing ground for television science, though radio science broadcasters remained valuable specialists for the BBC in producing both popular and cultural output for listeners. To translate their work into the visual medium, science broadcasters had to further foreground their expertise in producing output that would appeal to audiences. Consequently, scientists were largely marginalised from negotiations in science broadcasting production.

Science on television: Translating science broadcasting into the visual medium

It is important to point out that many BBC executives were not anti-television in the postwar period. Rather, they were wary of the effects of its development even as they saw it as inevitable. In an address to the BA in March 1943, BBC Chairman Allan Powell

[43] *Radio Times* 4 Feb 1955.

[44] *JRUL SC JBA* File CS6/2/1: Appleton to Lovell 11 Apr 1956, Fuller to Appleton 9 Nov 1956.

[45] *BBC WAC* File R34/851/7: Clow to Newby 28 May 1957.

admitted that television would soon become the "principal pre-occupation of the BBC".[46] However, as broadcasting and BBC historian Asa Briggs points out, BBC executives favoured the spoken word. The conservatism of network directors and controllers with respect to television, and especially its structural isolation, frustrated various producers and directors. Maurice Gorham, who moved laterally from controlling the Light Programme to become the first postwar Controller of Television, resigned in protest that television was not considered separate from, or as important as, radio within the organisation. Gorham's successor Norman Collins also resigned when, in October 1950, George Barnes was appointed by the Board as his superior in the newly created post of Director of Television. Collins had successfully argued for such a position to be created that placed television on an institutional parity with radio, but felt that Barnes, who had latterly held the post of Director of the Spoken Word, was not the right selection because his background and experience only extended to radio. The Governors, on the other hand, favoured Barnes' appointment as a means to temper Collins' enthusiasm to embrace the entertainment potential of television. Such was the acrimony of Collins' departure that he devoted most of his subsequent efforts to encouraging the breaking of the BBC's monopoly.[47]

Other television-minded producers and controllers lobbied hard on behalf of the medium amid these internal conflicts with the aim of encouraging BBC executives to overcome their wariness and, instead, embrace its inevitability and actively develop the Television Service. Cecil McGivern, who succeeded Collins as Controller of Television, and Cecil Madden, the experienced Television Programmes Organiser, were prominent advocates for television to be given equal status with radio.[48] Their cause to promote television was not helped by the potential costs of developing the technology and infrastructure for visual production and transmission, especially given the financial pressures on the BBC as a publicly funded institution in an austere postwar economy. Their cause was helped both by internal reorganisations that began the differentiation of departments into those that latterly concentrated on television and the 1949 Beveridge Report that questioned the BBC's broadcasting monopoly. Television-minded producers and executives who had long presaged and embraced both the advance of the visual medium and the increased importance of entertainment within an increasingly competitive broadcasting industry and culture were vindicated.

The Labour government inquiry into British broadcasting initially recommended the continuation of the BBC's monopoly. However, a minority report by Conservative MP Selwyn Lloyd recommended the breaking of the monopoly. Significant political support was gained for this notion of part-commercialising British broadcasting and, when the

[46] *BBC WAC* File R51/529: Address 22 Dec 1943.

[47] Briggs (1985), *op cit.*, pp. 243-257, 271-274, 291.

[48] T Boon (2008): 192-195.

Conservatives won the general election in 1950, the breaking of the BBC's monopoly was consolidated into a White Paper.[49] Haley and his successor as Director-General, Sir Ian Jacob, alongside their ally Director of the Spoken Word, Harman Grisewood, still regarded television as a secondary priority. Executives' preoccupation with defending the BBC's radio platforms meant that the monopoly would be broken in television.[50] The prospect of the founding of a television rival motivated BBC executives into devising and implementing a five-year, later extended to ten-year, plan to expand, develop and maximise the competitive potential of its television service. Their hope was to define television as another Reithian medium before their competitor began broadcasting. It was hoped that education and information could and would remain important in the more entertainment-oriented visual medium. The increased status and supported accorded to television allowed the latent visual ambitions of numerous producers and controllers to be released.[51]

As with radio science, television science offered broadcasters a means to provide both cultural and popular output to audiences. Yet, televising science was a very different prospect from producing audio science programmes and required, I argue, a distinct expertise. Producers and directors had to be expert in the medium of television. Radio science broadcasters had recognised the potential of the new medium for them to expand their remit and further reinforce the status of their professional identity. However, their expertise was considered to be in audio science and they were not generally supported or involved in early postwar explorations and experiments in televising science, though the experience of the likes of Cox in broadcasting science was, on occasion, consulted.[52] As radio science broadcasters had developed from radio producers keen to specialise in science programming in the interwar years, television science broadcasters developed from television producers keen to specialise in science programming in the postwar years. These television science broadcasters recognised the potential of popular demand for television science programming to allow them to forge a valuable specialist professional identity in a medium in which the conventions of production were distinctly different. Their expertise lay in their ability to produce science programmes that would conform to BBC executives' concern with enriching audiences, but also attract entertainment-demanding viewers in the first instance.

As with radio science, television science broadcasters felt that space science had certain attributes that meant it was prominent in postwar explorations and experiments in televising science. In the summer of 1949, producer Andrew Miller Jones, working with an

[49] BBC (2011).

[50] Cain, *op. cit.*, pp. 58-75.

[51] Briggs (1985), *op. cit.*, pp. 288-289, 295.

[52] *BBC WAC* File R51/523/5: Cox to Gorham 30 Apr 1946.

engineer from Royal Astronomical Society, proposed to the Head of Television Programming, Cecil McGivern, 'spectacular' ideas for televising the moon and solar prominences. Miller Jones argued that such programmes could not "fail to fascinate the human mind".[53] Similarly, Director of Television, George Barnes, noted to McGivern that there was a "small though zealous interest among a large range of people in astronomy" that could be exploited.[54] Despite the potential captive audiences and visual aspects of science programming, representing science visually on television was technically challenging as the technology of television production and transmissions infrastructure was still developing.[55] For example, in response to a query from Miller Jones regarding a potential production on space science, BBC television drama and documentary filmmaker John Elliot noted that a planetarium would not reproduce well on television but that it should be possible to "photograph the moon through a telescope" at the Royal Greenwich Observatory.[56]

The scope of broadcasting as a medium is as much determined by technological limitations as fashion and ambitions.[57] From its very beginning, with Reith an engineer, great emphasis was always placed on the technical quality of the BBC's work. Throughout the late 1940s and early 1950s, encouraged by departments with vested interests such as Outside Broadcasts and Documentaries, BBC engineers sought to improve televisual production standards and techniques. Many advances and improvements were made in camera quality, recording equipment and transmissions infrastructure through the development of electronic engineering.[58] In addition, for much of the postwar period, space science and the technology of broadcasting were intimately related in terms of transmissions. Engineers and experts in both fields collaborated particularly through the SAC under the influential space scientist Edward Appleton. Appleton appeared frequently in the BBC's schedules and in return assisted the BBC with the development of high quality and frequency (VHF) transmissions.[59]

Progress in the technological infrastructure of television was swift and producers were determined to overcome the remaining challenges to supply visual science programming. Television broadcasters eager to specialise in science were particularly keen to take advantage of the prevailing spirit of scientific nationalism in postwar Britain. Programmes on technological modernity proved popular with both viewers and conservative BBC executives because of the cultural prestige that surrounded postwar science. In 1950,

[53] *BBC WAC* File T32/256: Miller Jones to McGivern 7 June 1949, Griffiths to Murray 15 Aug 1949.

[54] *BBC WAC* File T32/57: Barnes to McGivern 8 Feb 1952.

[55] Boon, *op. cit.*, p. 184.

[56] *BBC WAC* File T32/57: Elliot to Miller Jones 9 Nov 1950.

[57] Boon, *op. cit.*

[58] *BBC WAC* File T26/9: Minutes 29 June 1953, 24 Nov 1953, 1 June 1954.

[59] *BBC WAC* File EVA 1c: Appleton to Clow 25 Feb 1955.

Talks producer Norman Swallow suggested to his television-minded boss Leonard Miall the possibility of organising a celebratory programme "in which eminent British people talk about the things of which we ought to boast". The same year, Swallow also advocated for extensive BBC coverage of the 1951 Festival of Britain, for which radio science broadcaster Ian Cox had become scientific director. Swallow suggested that such television productions should seek to emphasise the "spirit of the people and national recovery", including the pioneering contributions Britain was making to scientific progress in fields such as space science.[60] Similarly, in 1952 John Read, of the Talks department, sought to engage Jodrell Bank observatory radio astronomer Bernard Lovell's contribution to a film about science that he was producing that was part of a series built "around eminent British personalities".[61]

By 1951, television science broadcasters had largely cemented their value to the BBC by demonstrating that they too, like radio science broadcasters, could produce programming that attracted and sustained audiences yet demonstrated a commitment to their public service mandate. However, Mary Adams reminded all science broadcasters that that their programming was not automatically guaranteed a place in the schedules and that they must continue to demonstrate their value.[62] One advantage for television producers wishing to specialise in science programming was the malleability of scientific material to be presented in different genres. Features producer Nesta Pain recognised the fact that broadcast popular science could be presented in the form of news, features, talks and documentaries. Pain also suggested that it would be even more advantageous to television science broadcasters if drama could also be found in science so as to boost the entertainment potential of science programming.[63] In July 1953, the television serial *Quatermass* was the first attempt to create drama with science by highlighting the potentially dystopian implications of progress in space exploration. As Catherine Johnson argues, this production demonstrated that television drama could be used to display visual style and spectacle, in this case of science, despite many production difficulties.[64]

With broadcasting and broadcast science becoming more television- and entertainment-oriented, lobbyists from the scientific community resurfaced hoping to influence the development of science broadcasters.[65] From 1949 to 1953 a loose, largely socialist, coalition sought to exploit the intense prevailing political debates over the future of British broadcasting to contest the cultural authority over the production of

[60] *BBC WAC* File T32/330/1: Swallow to Miall 27 Apr 1950, notes by Swallow 22 May 1950.

[61] *BBC WAC* File CS7/13/5: John Read to Lovell 13 Mar 1952.

[62] *BBC WAC* File T32/330/2: Adams to Miller Jones 2 Mar 1951.

[63] Lord E Simon (1953): 171-185.

[64] C Johnson (2007): 59-63.

[65] Boon, *op. cit.*, p. 184.

representations of science on radio and television. The aim of the coalition faction was to 'enhance' science programming by ensuring that science broadcasters focused as much on performing a public relations role for science as entertaining the audience in science programming. Led by Birmingham University physics chair Mark Oliphant, the lobbyists approached the BBC's Board of Governors, or General Advisory Council (GAC), with their concerns, appealing to the Reithian commitment of the BBC's hierarchy that had been critically questioned by the Beveridge Report.[66] The GAC was then chaired by the industrialist and social reformer, Lord Ernest Simon of Wythenshawe, who personally questioned whether the BBC's science programming was focused too much on entertainment at the expense of information and education.[67] To ensure a more balanced presentation, and to influence the emerging television science producers, Oliphant suggested to the GAC that the BBC "might like to set up an Advisory Committee" on scientific broadcasting populated by scientists.[68]

The GAC consulted senior BBC science broadcasters with regard to this suggestion, finding, of course, that producers had their own professional motivations and interests in seeking to preserve their authority to represent science in whatever fashion they wished. Archie Clow argued that such a Committee would not be a valuable source of advice because scientists were "unfamiliar with our (BBC) requirements" in the production of science programming.[69] Clow was underlining the value of science broadcasters in terms of their specialist expertise in presenting science in the radio and television mediums. Only science broadcasters, Clow argued, understood the contemporary culture of broadcasting, with emphasis now more on entertaining rather than educating viewers and listeners, in such a way that they could produce programmes that attracted yet still enriched audiences. Clow, thus, sought to protect the professional mediating identity of science broadcasters by emphasising their expertise in presenting science in the broadcast media as specialist producers. Despite Clow's protests, the pressure from influential scientific experts such as Lawrence Bragg and AV Hill forced the BBC's Boards of Management and Governors to conduct an investigation in order to answer the lobbyists' criticisms.

The GAC's investigation analysed both audience attitudes and internal administration with regard to science programming, with particular reference to the educational and informational remit of the BBC's public service mandate. One concern of investigators was that the scientific knowledge of the audience varied widely and that, therefore, it was important that this was reflected in the level of science programming with the increased

[66] The GAC regulate the BBC by representing the interests of the public.

[67] Simon, *op. cit.*, pp. 84-86.

[68] *BBC WAC* File R6/34: Oliphant to GAC 16 May 1949.

[69] *BBC WAC* File R6/34: note by Clow to the GAC July 1949.

complexity and abstruseness of science itself.[70] The most pressing issue identified by this investigation, however, was the lack of a coherent organisation and policy among science broadcasters dispersed across the BBC's various divisions.[71] In November 1949, thus, the GAC reported to the Board of Management that "it would be an interesting experiment to get an adviser of high standing attached to the staff of the BBC for a year to study the problem" of science broadcasting.[72] However, the identification of a problem and the appointment of an adviser as the solution to this problem were not unanimously agreed among the Governors or Directors who recognised the value and expertise of science broadcasters. In particular, some executives felt that the existing approaches to science broadcasting were effective, if admittedly ad hoc, and that a supplementary adviser would only hamper these approaches as a "superfluous relay" that would undermine the identity of science broadcasters.[73]

Despite such dissent, in December 1949 George Barnes wrote to the lobbyists' leaders stating that both Boards had endorsed the notion of the appointment of a "scientific adviser". This downgrading from an advisory committee was the first step in the political manoeuvres of those BBC executives who resented outside attempts at interfering in their broadcasting profession to counter the criticisms of the lobbyists with a minimum of concessions to the demands for production authority. The second step was to ensure the appointment of an amenable scientific adviser who would not want or be able to interfere too much in broadcasters' work. It was for this reason that Barnes, though asking Oliphant, Hill and Bragg for their recommendations, pressed for the appointment of Sir Henry Dale, who was somewhat aware of the culture of science broadcasting, having previous experience with the BBC on talks and features.[74] Dale, recent President of the Royal Society, was appointed senior scientific adviser in early 1950 for an experimental period of one year. An announcement of Dale's appointment was made to the press to publicly demonstrate the BBC's commitment to working with the scientific community to improve its science programming. In this announcement, the third step to minimise the enforced changes was to publicly limit the remit of Dale's role to a figurehead appointment compared to that which had been agreed in formal discussions with the lobbyists. According to the press release, Dale would be a source of informal advice on content, rather than formally consulting on the organisation or policy of science broadcasters.[75]

[70] *BBC WAC* File R6/34: October 1949 'Listeners' Understanding of a Broadcast Talk on Science' report; File R51/523/7: Holme to Collins 21 Dec 1949; Somerville to Collins and Holme 23 Dec 1949.

[71] *BBC WAC* File R6/34: GAC Meeting 16 Aug 1949.

[72] *BBC WAC* File R6/34: GAC report 23 Nov 1949.

[73] *BBC WAC* File R6/34: recommendations 19 Dec 1949.

[74] *BBC WAC* File R6/186: Barnes 22 Dec 1949 to various.

[75] *BBC WAC* File R6/34: Barnes to Bronowski 25 Jan 1950; File R6/186: draft press announcement.

In the end, Dale served as adviser until late 1953. Dale's outgoing recommendations echoed the demands of the lobbyists in 1949: that some form of production oversight was necessary if BBC science broadcasters were to continue to contribute effectively to publicising science and building scientific literacy.[76] In other words, little had resulted from his tenure, just as many producers and executives had intended by manipulating the negotiations. There was some discussion among the BBC hierarchy about whether to appoint a successor to Dale. However, Mary Somerville, Head of the BBC's Secretariat and Controller of Schools Talks, spoke for the majority of broadcasters when she argued to Director of the Spoken Word Harman Grisewood that there was no need for a general adviser, given the expertise of specialist producers such as Clow. Somerville stressed that science broadcasters already acted as "advisers and departmental consultants very well" for science programming.[77] In addition, not everyone in the scientific community was convinced that BBC science broadcasting was flawed and that an advisory board was required. Appleton, for example, at the 1953 annual BA meeting in Liverpool, praised the "genius for production" of science broadcasters such as Clow in his *Science Survey* series. Appleton praised the expertise of BBC science broadcasters in producing programmes that both attracted audiences and contained scientific substance.[78]

The lobbying faction's challenge and Dale's appointment ultimately reinforced the production authority of BBC science broadcasters as being responsible for representing science in this medium. The professional identity of producers specialising in science programming was based on their expertise in adapting to and demonstrating a significant usefulness following changes in contemporary broadcasting culture and policy. This expertise meant that they were able to produce science programming that was both entertaining and informative and, thus, a valuable resource in terms of helping the BBC adjust to competition for audiences. Scientific experts could not regain any real level of production influence from their marginal position, because science broadcasting required specific expertise in media techniques such that science was presented in both an attractive and educational fashion. As Features producer Nesta Pain argued, when working on scientific productions, any suggestions from expert consultants regarding scientific accuracy were accepted without question, but presentation was the "BBC's business alone".[79] Only celebrity scientists, especially if they were talented expositors in broadcasting, were deferred to by broadcasters and allowed a significant production influence. Bernard Lovell was a prime example, as we shall see in chapter six. Lovell exploited the profile and prestige of Jodrell Bank and producers' associated demand for his contributions to exploit the broadcasting medium to help construct a narrative of

[76] *BBC WAC* File R6/186: Dale report to Governors 13 Jan 1953.

[77] *BBC WAC* File R6/186: Somerville to Grisewood 16 Aug 1954.

[78] *Nature* 30 Jan 1954.

[79] Simon, *op. cit.*

scientific modernity around the telescope project. However, many science broadcasters also harboured scientific sympathies and their deferential interactions with scientific experts in production and filming meant that on many occasions, programmes reflected the attitudes of scientists who petitioned the BBC.[80]

Though all science broadcasters found their professional identities reinforced, it was television science broadcasters who had most to gain from the official recognition that the development of science broadcasting would be guided by developments in media culture. Television was the growing industry and television science broadcasters sought to demonstrate the value of their expertise in producing programmes in this entertainment-oriented medium and be carried along with its advance.[81] By 1953, television science programming had surpassed radio science in terms of value as a broadcasting resource. The 1952 *The Moon* programme was typical of science programming in that both scientists and lay audience members enjoyed and approved of it. Science on television had, thus, become a staple of the schedules and, with the likes of *The Moon* being actively promoted to viewers by programme organisers and the Publicity Office, part of the BBC's flagship output.[82] February 1952 saw the inauguration of *Science Review*, the first full-length science documentary series that was watched by over ten per cent of the viewing population. The same year saw the zoologist and Television Talks producer James McCloy provide the first television series for a specialist professional group with *Medicine Today*.[83] Crucially, in 1954, the long-threatened national commercial television competitor to the BBC was incorporated. The business focus of the national rival on attracting the largest possible audiences was a severe challenge to the BBC as a public service institution committed to minority programming. Science programming became a key means by which to responsibly entertain audiences and television science broadcasters became invaluable specialist producers. The professional identity and expertise of science broadcasters as industry resources was confirmed.

Public-service populism: Science programming and commercial television

Broadcasting scholars often note that the Coronation of 1953 was the watershed for television's dominance over radio in terms of audiences. From 1954, certainly, television

[80] Boon, *op. cit.*, pp. 185-191.

[81] J Bennett (1999): 159-162.

[82] *BBC WAC* File T32/330/3: Jackson to Goldie 9 May 1952; File T32/256 TV Talks: The Moon 1949-1952: Wheldon to Miller Jones 7-17 Oct 1952.

[83] Gregory and Miller, *op. cit.*, pp. 41-51.

was the principal preoccupation of British broadcasters. This year saw the symbolic abolition of the previously influential post of BBC Director of the Spoken Word.[84] The same year saw the first European Broadcasting Union (EBU or 'Eurovision') international television 'hook-up'.[85] 1954 also saw the writing of the Independent Television Authority (ITA) Act into law. This Act authorised the breaking of the BBC's monopoly by a commercial television competitor. The ITA Company was launched and began broadcasting in September 1955. In the middle 1950s, then, BBC executives and producers had to devote more resources to the Television Service. BBC broadcasters also had to devise a strategy that would allow them to compete with ITA's commercial goals of attracting the widest possible viewing audience within the elitist constraints of a mandate to supply a public service.[86] Director-General Ian Jacob allowed some measure of editorial responsibility to be devolved downwards, so that producers would be responsible for using their expertise to keep the BBC competitive in terms of entertainment, but free of criticism of pandering to populism.[87]

One division that was particularly eager to exploit the opportunities of this period was Television Talks, founded in 1953 and headed by Mary Adams, Leonard Miall and Grace Wyndham Goldie. Adams, Miall and Goldie gathered a collection of ambitious trainee television producers, writers, directors and researchers, many of whom went on to executive posts as high up in the BBC as Director General. With the support of Controller of Television Cecil McGivern, Miall and Goldie, in particular, hoped their staff would play a crucial role in developing and defining the BBC's televisual output so as to mitigate the effects of the experiments of their commercial rivals. From 1955, Jacob, who favoured catering to the elites at the expense of the mass audience, gave the Television Talks team what he felt to be the important responsibility for BBC non-fiction broadcasting.[88] Television Talks became a miscellaneous division charged with producing programmes in all genres except news, education, public events, drama, sport or light entertainment.[89] Despite being delegated a remit that was conducive to neither television nor entertaining mass viewers, this team pioneered programmes that attracted large audiences to serious output such as *Tonight*, *Panorama*, *Monitor*, *Zoo Quest*, *Gallery*, *Face to Face*, and *Science News*, in a range of experimental formats including talks, documentaries and features on topics ranging from current affairs to science to gardening. The main focus was studio-

[84] A Briggs (1960): 7-10, 30, 274-276, 288-290. A Crisell (2002): 82-84, 93-94, 152-153.

[85] Headed by former BBC Director-General Ian Jacob for its first decade, the EBU is a confederation of seventy-five broadcasting organisations (radio and television companies) from fifty-six countries, and forty-three associate broadcasters from a further twenty-five nations based in Geneva. Twenty-three companies from Europe formed it on 12 February 1950. For more information see: EBU (2011).

[86] P Elliot (1977): 143, 164-169.

[87] T Burns (1977): 186-210. K Kumar (1977): 231-233, 239-248.

[88] Boon, *op. cit.*, pp. 203-209.

[89] J Cain (1992): 58-75. A Crisell (2002): 97-100.

based live television shows, of which a significant number were science programmes and series.[90]

Within this division, producers such as David Attenborough, Andrew Miller Jones, George Noordhof, Paul Johnstone and James McCloy began to specialise full-time in producing science on television. McCloy in particular felt that science was a natural genre for television, even if the rules of its presentation had yet to be worked out and most programmes still followed the Talks tradition. For television science broadcasters, the new-found editorial freedom was an opportunity to demonstrate their expertise in producing television science that could provide an invaluable resource for the BBC in terms of both entertaining and educating viewers. As Tim Boon argues, the likes of Attenborough and McCloy sought to demonstrate to both viewers and BBC executives that their programming could provide an "enrichment of the audience's experience".[91] In the process of demonstrating this expertise, the professional authority and identity of television science broadcasters as science-mediating specialists was further elevated.

Television Talks was the main centre for scientific programmes for most of the 1950s. Yet, broadcasters wishing to specialise in science programming were not, of course, confined to this division. Encouraged by McGivern, executives in departments such as Drama, Documentary and Magazines, and especially Outside Broadcasts and Features head Aubrey Singer, were also eager to exploit audience demand for science programming, and helped keen producers specialise to become television science broadcasters in genres and formats other than talks. Singer and the Outside Broadcasts division would become the biggest rivals to Television Talks for responsibility for science programming, with productions such as *The Restless Sphere* – the story of the IGY in collaboration with Lovell and Jodrell Bank – being both big science and big television.[92] Editors in the News Division also encouraged their staff to report on topical scientific matters such as the potentially televisual aspects of developments with the iconic Jodrell Bank radio telescope project.[93] With devolved production and editorial freedom to compete with external broadcasting rivals came such interdepartmental rivalry for prized scientific material and schedule space. Departmental science broadcasting expertise became a negotiating tool for those seeking the responsibility for, and authority over, the BBC's science programming output.

Such internal rivalry, though perhaps stoking confusion and tensions between staff, was of overall benefit in terms of encouraging improvements in the quality of science programming. McGivern was keen to point out to Director of Television George Barnes that

[90] Briggs (1985), *op. cit.*, p. 305.

[91] Boon, *op. cit.*, pp. 192-195, 209, 232.

[92] *Ibid.*: 199-208, 214-219.

[93] *BBC WAC* File T32/330/5: Voss-Bark to various 10 Nov 1954.

it was "interesting and gratifying to see that science, medicine, etc programmes were amongst the most popular programmes" in the BBC's schedules, frequently rating higher than many light entertainment shows and plays.[94] In addition to noting the success of science programming in terms of attracting and entertaining mass viewers, television science producers such as Noordhof were also keen to note that critical and scientific reaction had been "encouraging on the whole" to series such as *Science in the Making*.[95] Controllers and producers keen on encouraging the continued development of television, and television science, were emphasising that science broadcasters were specialist resources whose expertise lay in producing programming that was compatible with both public service and commercial ideals. Though the effect of these endorsements on BBC executives is unknown, controllers encouraged specialist science producers in making science programming in various formats a regular presence in the television schedules.

Aeronautics and space science was a topic commonly considered by television science broadcasters because of the extensive popular enthusiasm with the subjects and their professional respectability. In Television Talks planning discussions, Johnstone, in responding to Miall's call for programme suggestions, suggested that spaceflight would be "natural as a programme and arouse a good deal of interest and publicity" as well as attracting viewers. Johnstone added that such a production could also play an informative role by helping to "re-adjust the balance in the popular mind between the lurid 'space-ship' nonsense and what is in fact scientifically feasible".[96] Noordhof also stressed the entertaining and educational aspects of space science in proposing various programmes on cosmology, the 'conquest of space' and 'the month's sky' presented by George Porter, a known personable astronomer from the Royal Greenwich Observatory.[97]

The manner in which science broadcasting developed as a valuable broadcasting specialism subject to changes and negotiations within media culture was exemplified by James McCloy's and Arthur Garratt's 1956 series *Frontiers of Science*. With the International Geophysical Year (IGY) officially underway, one programme in the series focused on high-altitude aviation and space medicine. Publicising production assistance of and an endorsement from the Royal Air Force allayed potential criticisms from BBC executives and the scientific community of broadcasters' pandering to populism. Science broadcasters also considered whether such exemplars could be employed as a means of indoctrinating scientists in the contemporary production conventions of science programming. Of more concern to McCloy and Garratt was that the programme "occupied a large percentage of the adult television public who largely enjoyed it more than usual televised talks or

[94] *BBC WAC* File T32/330/4: McGivern to Barnes 23 Jul 1953.

[95] *BBC WAC* File T32/330/4: George Noordhof to Miall 17 Nov 1953.

[96] *BBC WAC* File T32/330/4: Johnstone to Miall 24 Nov1953.

[97] *BBC WAC* File T32/330/5: Noordhof to Miall 22 Sept 1954.

documentaries", despite the difficulties of visualising space on television. McCloy himself was pleased with the programme's "interest, integrity, and liveliness on screen".[98]

The arrival of a commercial televisual competitor to the BBC had favoured entertainment of the Reithian ideals. Science broadcasters – that is, producers who specialised in science programming – had become invaluable because output on topics such as space science was able to adhere to all the public service ideals. Beginning in April 1957, *The Sky at Night*, produced by Paul Johnstone and presented by amateur astronomer Patrick Moore, was a prime example of why science programming and science broadcasters profited from developments in contemporary BBC culture. Building on the amateur Talks tradition, Johnstone and Moore pitched the series to entertain lay viewers and inform the significant minority with an interest in astronomy.[99] Above all, however, science broadcasters believed that that science programming, generally, "could be made into very good television" if approached with imagination and originality in production.[100] Even the Board, eventually, formally acknowledged the importance of science broadcasters to the BBC in terms of attracting viewers, because audience reaction suggested there was a public "eagerness" for scientific programming.[101] This acknowledgement of the nature of science programming as a competitive resource was echoed by McGivern's successor as Controller of Television Programming, Kenneth Adam. Adam offered to Miall to invest more resources in the BBC's science production "strength" or expertise, so as to be able to produce science programmes in some suitable format so as to compete with the increasing quantity of popular science being presented in the print media by science journalists in newspapers and in burgeoning magazines like *New Scientist*, as well as by their commercial broadcasting rivals.[102]

In the autumn of 1957, Leonard Miall charged his Television Talks team with generating ideas for forthcoming programme topics in the *Frontiers of Science* series. James McCloy, a trained zoologist who was now the most prolific and expert science broadcaster within the BBC, responded to Miall's call for ideas:

> "I am going to do rockets and space travel. There has been a great deal of talk and writing about space travel and people are confused about the scientific possibilities. I think the programme can be both (sic) entertaining, interesting and responsible".[103]

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[98] *BBC WAC* File T32/627/1: McCloy to Miss McCallum undated programme blurb, Audience Research Department Report 8 Feb 1956; File T32/626/1: Film retention form June 1957.

[99] P Moore (2005): 28-36, 150-152.

[100] *BBC WAC* File T32/1184/1: Angeloglou to Goldie 2 May 1957.

[101] *BBC WAC* File R34/851/7: Report from Dr JR Simons to Miss LC Cohn.

[102] *BBC WAC* File T32/1184/1: Adam to Miall 17 Apr 1957.

[103] *BBC WAC* File T32/626/1: McCloy to Miall 18 Sept 1957.

His timing was fortuitous, for in October that year the Soviets placed the world's first artificial satellite – Sputnik – into orbit. McCloy reacted quickly, producing a programme exploring the possibilities of human space travel featuring Moore less than a week later.

More than being fortuitous, this production exchange encapsulates the development of science broadcasting at the BBC. Commercial radio, the advance of television and the breaking of the BBC's monopoly meant that broadcasters now faced competition for audiences. The BBC had to formulate a strategy that would counter rivals' bids to attract the widest possible viewing and listening publics within a public service mandate. With popular interest in science high, science programming was one way for the BBC to seek to compete for viewers. In addition, science broadcasters emphasised that their programming offered the virtues of being entertaining, interesting and responsible. The increased value of science programming to the BBC meant that producers who had chosen to specialise in science programming found their professional identities enhanced. Science broadcasters, especially in television, were invaluable specialist resources. The development of science broadcasters was intimately related to developments in broadcasting culture and, thus, dependent on their foregrounding of media or broadcasting expertise and partisanship. The unique expertise of television science broadcasters lay in their ability to produce programming that allowed the BBC to entertain audiences and compete commercially without being accused of pandering to populism, rather than demonstrating any commitment to or expertise in science, as with science writers.

Conclusion

From the 1920s to the 1950s, British broadcasting was in a state of flux. For those within the BBC, this flux provided both challenges and opportunities. First overseas radio, then television, then commercial television tested the BBC's hierarchical focus on radio and its broadcasting monopoly. Executives had to come to terms with the fact that not only would the BBC have competitors, but that its rivals would focus on attracting the widest possible audiences, especially television viewers. Entertainment became the main commodity traded by broadcasters. However, the BBC was also constrained by its public service mandate and attracted criticism if it was felt that the balance of their output was being tipped in the favour of entertainment over educational and informative programming. In response to this challenge to balance the Reithian ideals, BBC executives placed their faith in producers to supply programming that would remain cultural and competitive.

Science programming was one genre that producers turned to in the light of these developments in broadcasting culture, with such programming previously marginal to the schedules. High-profile developments in science, especially space science, meant that science programming was increasingly popular with audiences. The associated increased prestige of science enabled producers to insist that programmes on science would be inherently cultural. In the interwar years, producers emerged who recognised and sought to exploit the dual popular and cultural aspects of radio science programming by specialising in their production. These radio science broadcasters forged an authoritative professional identity by demonstrating their specialist expertise in supplying science programming that resonated with the prevailing broadcasting culture, and that allowed the BBC to remain both competitive and above criticism. It was this necessity to be expert in media culture and representing science in the broadcast media that meant that scientists were marginalised from the negotiations of the development of science broadcasting. The postwar years were a watershed for science broadcasters with their status as a specialist industry resource being reinforced, and not just because of the heightened influence and drama of science. Developments in postwar broadcasting culture and technology further altered negotiations in, and the mechanics of, the common production arena, and offered further opportunities for the development of science broadcasters. Television science broadcasters in particular advocated the importance of television and television science to the BBC in their aim to compete with a commercial rival. Television science broadcasters forged a professional identity as an invaluable resource because of their expertise in producing programmes that would attract and entertain mass viewers with serious output. In this sense, science broadcasters exploited science and the authority of media culture over the common production arena to create a specialist broadcasting need.

The period following Sputnik was one in which British broadcasting media was subject to even more intense competition for audiences and technological change, both of which impacted on the negotiations in, and the mechanics of, the production arena. In this space-age broadcasting culture, science programming and science broadcasters became even more valuable resources for the BBC. Developments in space science, in particular, were crucial to the development of the BBC, rather than merely one tool to be exploited by science broadcasters. First, these developments allowed science broadcasters to consolidate their status as science-mediating specialists in the production arena by supplying the content with which they expertly constructed programmes that allowed the BBC to compete with commercial rivals for vast popular science audiences as a public-service institution. In addition, the same space science developments also offered potential technology with which broadcasters could seek to revolutionise methods of broadcasting production and distribution. However, neither of these pathways could

prevent British broadcasters from struggling to maintain a leading position in a global broadcasting era.

Chapter Five

The BBC in the space age: Using science broadcasters and satellite broadcasting to compete for audiences

In the previous chapter, we saw how space science was an invaluable professionalising tool for science broadcasters. Space science offered audio and visual material that enabled science broadcasters to demonstrate their expertise in producing programming that was both popular and cultural. Science programming was, thus, one genre that allowed the British Broadcasting Corporation (BBC) to compete with commercial rivals for mass audiences within their public service remit. Yet, when the Soviets launched the world's first satellite – Sputnik – in October 1957, the BBC was losing the battle for national ratings. Soon, the BBC and British broadcasters would begin to feel the effects of international competition for listeners and viewers. In the post-Sputnik period, space science became a key tool with which both executives and producers sought to maintain the BBC's broadcasting pre-eminence. The importance of space science to broadcasters had two aspects: programming and technology. Space technology offered the means to reach and create new audiences. A potentially global industry was expected to instil an increasingly commercial and populist broadcasting culture. Space programming was, in this period, a crucial resource for British broadcasters in seeking to secure such new audiences in a more populist culture. Though, on occasion, there was some overlap, I will treat these two aspects separately throughout this chapter, because science programming and satellite technology were largely considered by BBC actors as independent tools with which to compete for global audiences.

With the launch of Sputnik, the space race became the dominant news story of the next fifteen years. At the time, BBC ratings were at their lowest ebb. BBC executives responded to this ratings crisis by allowing and encouraging editors and producers to provide output that would appeal to the widest audiences. Newsworthiness and entertainment became the guiding production principles for BBC broadcasters, though the importance of demonstrating a commitment to educating and informative programming was not forgotten. Programming on space science was of great cultural and popular appeal and, thus, of great value to the BBC in competing for listeners and viewers within a public service mandate. Science broadcasters – that is, producers who specialised in science programming and, later, broadcast science journalists – found their professional authority and identities further enhanced because of their expertise in producing such programming. The more entertainment-oriented broadcasting culture meant that science broadcasters had to foreground their loyalty to, and ability to engage with, the attitudes of audiences.

In the 1960s, this foregrounding instigated scientists to pressure susceptible producers into helping preserve, rather than question, the social authority of science, as with representations in the print media constructed by writers which they felt to be overly critical. However, though preserving the legitimacy of science was important to science broadcasters, scientists themselves remained marginal to the common production arena.

More than just being a source of programme material that allowed science broadcasters to forge a social identity in the negotiations in the arena under the authority of media culture, developments in space science altered the mechanics of the arena itself. Sputnik showed the potential of communicating and transmitting via space. BBC and national partners, like many broadcasting organisations in Europe, America and Russia, explored and experimented with satellite broadcasting. A future global satellite broadcasting marketplace was assumed, and certain representatives sought to position the BBC as a leader in the field. The aim of satellite-minded executives and producers was for the BBC to be able to cover the latest global events, such as the space race, on their own terms, and then supply such programming to new audiences. However, in the 1960s, the complexity and cost-effectiveness of constructing a satellite broadcasting infrastructure was prohibitive and inhibiting for a public service broadcaster. Combined with indifferent national and BBC executive policy, ultimately, British broadcasting institutions became significant consumers of satellite broadcasts.

By the end of the 1960s, it was mostly the efforts of broadcasters on the domestic front that had played the major role in the BBC's competition for listeners and viewers. Science broadcasters played a prominent role in helping the BBC counter innovations implemented by their national commercial rival the Independent Television Authority (ITA) to attract audiences, for example with experimental genres of their own, such as science magazines on the second channel. Yet, as with any media specialists, science broadcasters were subject to the vagaries of popular fashion. Therefore, as popular ambivalence towards science became widespread even before the pinnacle of the *Apollo* programme, the importance of science broadcasters as an industry resource somewhat diminished which was construed as another manifestation of the 'problem' of science in the media. The opening of the space age had seemed to offer potential solutions to a floundering BBC, but by the time of the moon landings had only compounded the challenges for British broadcasters of securing significant audience shares. Ultimately, satellite possibilities only had an indirect effect on British broadcasters by driving the expectation of intensifying competition in the industry.

Challenges and opportunities for science broadcasters in an entertainment culture

As veteran astronomy broadcaster Patrick Moore wrote, the launch of Sputnik brought into reality the long-held popular fascination with the idea of space travel and exploration.[1] Its timing was fortuitous for the BBC Television Talks team, whose *The Sky at Night* monthly series had begun the previous April. In the 19 October 1957 edition of the show, Moore brought the latest news of the Soviet satellites. Audience research suggested that the majority found the programme "especially interesting", though, of course, the reaction was neither representative nor unanimous.[2] The conducting of audience research had become an increasingly prevalent feature of broadcasting culture. It is significant that Moore and the programme's specialist science producer Paul Johnstone had sought to capitalise on the interest aroused by Sputnik, and had retrospectively checked whether the show had attracted and exploited this audience enthusiasm. Attracting the widest audience became much more of a concern for BBC executives in this period, and science broadcasters were valuable tools in this aim.

By 1957 and 1958, ITA's focus on entertainment had led them to draw significant audiences away from the BBC. The BBC's response to this ratings crisis has been well documented by broadcasting scholars.[3] Overcoming their preoccupation with their public service mandate, BBC executives promoted individuals who it was felt could oversee output that would compete with the ITA. Hugh Carleton Greene was the most high-profile appointment, first as Director of News and Current Affairs and then, in 1960, as Director-General. The BBC's new Directors, and especially Greene, encouraged producers to base their programming policy on being more attentive to audience interests and demands. A new production culture was instilled in the BBC based on entertainment and newsworthiness; though it was also stressed that such output could and would remain stimulating and responsible. It was this change in broadcasting culture that was both a challenge and opportunity for science broadcasters.

In late 1957, science programming still largely emanated from the Radio and Television Talks departments of the BBC, the teams most experienced with the genre. Producers herein were, in a sense, primed to take advantage of the demand for science and space science programming following Sputnik. Producers in the Talks division, for example, told the Board that they felt that their "planned emphasis on (Soviet) science and technology during this period was given point and impetus by the launching" of Sputnik. These radio

[1] P Moore (2005): 28-36, 150-152.

[2] *BBC WAC* File T32/1859/1: report 4 Nov 1957.

[3] See, for example: A Crisell (2002): 108-109, 172-185.

science broadcasters also added that their decision to focus on the British contribution to the space age was boosted by Jodrell Bank's role in tracking the satellite's carrier rocket, on which topic Bernard Lovell delivered a talk.[4] Television science broadcasters also sought to capitalise on the post-Sputnik popular interest in space science to produce programming that would attract mass audiences. For example, Mary Hewat of Granada, a franchise of the ITA, secured Lovell's exclusive appearance on *Youth Wants to Know* at the time when he was overseeing the use of the telescope to confirm the satellite's orbit.[5]

The status of science broadcasters was boosted by the appointment of Kenneth Adam as Controller of Television Programming (and later to Director of Television) in the executive reorganisations of 1958. Adam had been motivated by Fred Hoyle's early 1950s criticisms in *The BBC Quarterly* of broadcast science and was "determined to see the popularisation of science take a big, planned leap forward".[6] Adam consulted McCloy as the most experienced science broadcaster as to the policy of science programming. McCloy reported that science broadcasters were coming to terms with the more entertainment-oriented culture that meant that producers now had to have an "excuse to come into viewers' homes at a peak hour" and present science. However, he added that for science programming, this 'excuse' was often difficult to generate in terms of presentation, because science broadcasters were constrained by the demand to provide output that was "responsible as well as entertaining".[7] Adam, though, was convinced that science programming could play a key role in allowing the BBC to compete with ITA in entertaining audiences within a public service mandate. Lovell's 1958 Reith lectures, *The Individual and the Universe*, showed how high-profile and prestigious science was in the space age.[8] Photographs transmitted by the Russian Lunik III from the far side of the moon included in the October 1959 edition of *The Sky at Night* demonstrated that science programming could provide the required 'excuse'. McCloy himself knew that science had aspects that could undoubtedly form programmes that would unashamedly attract audiences when he proposed programme on a submerged car experiment. McCloy told Goldie that such an experiment would provide "dramatic programme material with good publicity value".[9]

The identity and authority of science broadcasters was reinforced because of their expertise in producing such entertaining yet responsible programming. Adam offered much support and improved resources to science broadcasters as a strategy to meet the challenge of the BBC's external broadcasting rivals. However, the leap forward of science

[4] *BBC WAC* File R34/851/7: Anon 'Material for Board Report Sept-Nov 1957'.

[5] *JRUL SC JBA* File CS6/2/2: Hewat to Lovell 9 Oct 1957.

[6] *DWPC* (Misc.): Newspaper cutting 10 Feb 1971 by Adam.

[7] *BBC WAC* File T16/623: McCloy to Adam Oct 1958.

[8] *BBC WAC* SFC: A&A: 9-30 Nov 1958.

[9] *BBC WAC* File T32/1184/3: McCloy to Goldie 8 Apr 1959.

broadcasting under Adam was far from planned, with Adam's encouragement of science programming being spread across all the BBC divisions with a claim to the genre. As a consequence, there was much interdepartmental rivalry for production authority over science programming, with various divisions seeking to develop their science broadcasting expertise and demarcate and differentiate the appropriate televisual formats for presenting science and its various subjects.[10] Yet, it must be noted that there were also frequent instances of interdepartmental collaboration in the competitive interests of the BBC.

In January 1958, the Television Talks team felt that their responsibility and priority for science programming established five years previously was under threat. Experienced television science broadcaster James McCloy told Grace Wyndham Goldie, Assistant Head of the department, of his concern that, despite working on science programming for ten years, they broadcast only "ad hoc offerings" to eager audiences. McCloy was convinced that the appreciative audience for their occasional programmes would increase with regularity, and that a regular science reporting "magazine" or science news programme could exploit these latent viewers, but there was inadequate staff for this bid to claim authority for all BBC science programming to succeed. Goldie was more concerned that their division looked "ill-informed" about major scientific occurrences, especially compared to the Outside Broadcasts department.[11] The Outside Broadcasts team had been given more support and organisational prominence by BBC managers, and, under Assistant Head Aubrey Singer, took a strong interest science programming. The Outside Broadcasts division contained the expertise of prolific science broadcasters such as Philip Daly. Encouraged by Singer, Daly and other producers specialising in science undertook complex productions such as the 1958 show *Breakthrough*, the story of rocketry and satellites, which included live footage from Jodrell Bank, which was treated as a natural television studio.[12] The Television Talks and Outside Broadcasts teams frequently clashed. For example, both divisions almost concurrently produced a broadcast on satellites. With the importance of science to global affairs in the Cold War and space age, the News and Current Affairs departments also sought to strengthen their expertise and claim authority over science programming, though mainly in terms of reporting science news.[13]

The blanket executive support and emphasis on entertainment was not just of concern to those in the Television Talks department seeking to protect their identity as the BBC's

[10] T Boon (2008): 209-210, 214-219.

[11] *BBC WAC* File T32/1184/2: McCloy to Goldie 15 Jan 1958, Goldie to McCloy 17 Jan 1958.

[12] *BBC WAC* File T32/626/1: Goldie to Singer 9 June 1958. *JRUL SC JBA* File CS3/19/1: Singer to Lovell 18 Sept 1958, first draft of script, transmission 12 Nov 1958.

[13] As well as the BBC and other broadcasters, newsreels were also interested in and favoured space science for the same reasons. For example: *British Pathé* 7 Nov 1957 and 16 Nov 1959.

science broadcasting experts. In the autumn of 1958, a deputation of prominent scientists, including the Presidents of the Royal Society (Cyril Hinshelwood), BA (Alexander Fleck) and Royal Institution (William Lawrence Bragg), and the Chair of the Advisory Council on Scientific Policy (Alexander Todd), approached the BBC Board with the hope of incorporating a science department or appointing a senior scientist to the staff with production oversight.[14] The hope of the deputation was to place science on an equal footing with drama or religion within the BBC with an organised programme of popular science broadcasting. Jacob took the criticisms of a shortage of science programmes and of the organisation of science broadcasters seriously and started a series of internal discussions. McCloy and Singer joined forces to vehemently defend producers' independence and their expertise in the culture and techniques of the medium that enabled them to produce science programming that would entertain viewers.[15] Neither Singer nor McCloy supported Jacob or the GAC's compromise of appointing a coordinator, and in the end little resulted from this approach, with producers' autonomy from scientific control and accountability to the public for presentations successfully defended.[16] Science broadcasters such as Singer remained reliant on scientific experts such as the space scientist Harrie Massey for technical help and on screen contributions. Edward Appleton admitted that scientists, thus, knew that producers would often defer a significant production influence to them because of the important role science broadcasting played in the BBC's competition with ITA.[17]

Adam, Goldie, Singer and McCloy did privately acknowledge that science broadcasting heading into the 1960s had its problems. In particular, departmental liaison was an issue which impacted negatively on the strength of the BBC's science broadcasting expertise.[18] In terms of policy and presentation, Goldie and McCloy were "alarmed at the necessity to make it (their output) 'popular'" in the culture focused on meeting the challenge of ITA yet not incur the wrath of scientists.[19] The technical difficulty of producing science programmes also remained. For example, in September 1959, BBC radio producers sought to broadcast live from Jodrell Bank during a Soviet attempt to guide a rocket to the moon, but the sound was of insufficient quality.[20] Goldie reported to Greene's Assistant, Harman Grisewood, that there was a great "degree of complexity" involved in creating science programmes. Goldie added another problem for science broadcasting in that this degree of complexity meant that science production required a considerable expert staff and was a

[14] *BBC WAC* File T16/623: Minutes 22 Oct 1958 and 17 Nov 1958.

[15] *BBC WAC* File T16/623: McCloy to Adam 7 Oct 1958, Singer report 17 Jun 1959.

[16] Boon, *op. cit.*, pp. 221-224.

[17] *BBC WAC* File TVART2 Massey: Singer to Massey 22 Feb 1960; File EVA 1c: Appleton to Clow 12 May 1960.

[18] *BBC WAC* File T16/623: Report 17 Jun 1959.

[19] *BBC WAC* File T32/1184/4: Goldie to Adam 14 Oct 1960.

[20] *BBC WAC* File R34/585/5: various memos 18-23 Sept 1959.

time consuming and expensive business.[21] Another difficulty was the priority given to television science broadcasters over radio science broadcasters for science programming. In the same report to Grisewood, Goldie stressed that television, because it was a visual medium, could "present science in a highly effective manner", as audience figures for their programmes proved.[22] On the other side of the fence, Hector Rooney Pelletier, the Controller of Sound Programme Planning, made an impassioned plea to the Board on behalf of radio science broadcasters. Rooney Pelletier argued that sound coverage of events in the early space race, such as Scott Carpenter's *Mercury 7* flight in May 1962, could provide a "sense of immediacy", a broadcasting 'tour de force', that television could not yet achieve.[23]

Radio did play a key role in coverage of early space age events, especially News team coverage of the US *Mercury* manned space programme. On their staff was Reg Turnill, a journalist recruited to the BBC as an Industrial Correspondent but assigned to the Aerospace beat following Sputnik. Turnill's space expertise was crucial to the BBC's News division coverage of the space race over the next decade and more. Turnill worked with the Corporation's Programme Planners such as Joanna Spicer, Foreign Editors, and overseas correspondents and engineers, to provide radio coverage of US space shots. For the first suborbital spaceflight, when Alan Shepard, in *Mercury 3*, in May 1961 became the first American in space, Turnill was authorised by Anthony Wigan, Foreign Editor, to provide a live broadcast to be transmitted on the evening Light Programme.[24] Wigan was keen for an extended procedure to be accorded to future flights and promoted as a flagship of the radio schedules, especially for John Glenn's orbital flight in February 1962.[25] However, senior radio executives decreed that, following such space 'firsts', subsequent events would get immediate attention but "not on the (same) scale", for example extending the nearest news summary instead of justifying prime schedule space, especially with the resources wasted on flight delays.[26] Part of the reason for this decision was that radio was quickly surpassed by audience demand for live visual coverage of the major space age events and technical improvements in television transmissions.

By 1962, then, science broadcasters had encountered numerous opportunities and challenges since Sputnik opened the space age. For the first time, executives had explicitly deemed science programming as a key tool in the BBC's armoury for competing for audiences. Accordingly, the professional identity of science broadcasters was further

[21] *BBC WAC* File T32/1184/4: Goldie to Grisewood 14 Oct 1960.

[22] *Ibid*.

[23] *BBC WAC* File R34/851/14: note by Rooney Pelletier 24 May 1962.

[24] *BBC WAC* File R28/309/1: Wigan memo 24 Apr 1961, Wigan to Spicer 9 Oct 1961.

[25] *BBC WAC* File R44/836/1: Campey to Rooney Pelletier 5 May 1961; File R28/309/1: draft press release 25 Jan 1962.

[26] *BBC WAC* File R28/309/1: Straker to Wigan 1 June 1961, Bell to Marriott via Wigan 31 May 1962.

elevated because of their expertise in producing programmes that would entertain and educate listeners and viewers. However, science broadcasters also faced many challenges in the new broadcasting culture focused on contesting the ratings slide. The likes of McCloy had to produce programming that was entertaining yet responsible with limited budget and technology. There were also rivalries between science broadcasters in different departments, including between radio and television teams, to be recognised as the in-house science programming experts, with such tensions often meaning specialist producers worked against each other rather than collaboratively in the BBC's best interests. This dispersal of talent also meant each division did not have the level of expertise it required to extract full value for the BBC from contemporary events through science programming.

1962 was a critical time for British broadcasters in general. A Television Talks and Current Affairs team programme on the history and future of television reported that British broadcasting was in a "state of flux both technical and political".[27] The technical flux, as we shall see later, referred to satellite broadcasting. Political flux referred to the imminent Pilkington Committee. For science broadcasters, the Pilkington Report meant that they would face another challenge to their production authority from scientists keen to counter critiques of the social authority of science in the media. Science broadcasters would find their status as a specialist industry resource reinforced by this challenge, but problems identified with the organisation and policy of science broadcasting would critically remain unsolved.

The Science Consultative Group: Deflecting science broadcasting problems

In June of 1962, the Pilkington Committee delivered its recommendations. The Report's main remit was to evaluate the organisation of British broadcasting, but a major focus was on addressing the perception that television, in particular, had become trivialised.[28] Lobbyists from the scientific community sought to exploit this concern by suggesting to the Pilkington Committee that trivialisation was also affecting the quantity and quality of science programming and, thus, adversely affecting the public appreciation of science.[29] The Inquiry, as science writer Anthony Michaelis reported, obliged BBC executives to enter into dialogue with lobbyists' representatives to discuss changes to the organisation and

[27] *BBC WAC* File T32/1184/6: Stone to Goldie 7 May 1962.

[28] BBC (2011).

[29] Boon, *op. cit.*, pp. 225-227, 237-240.

policy of science broadcasters.[30] It is unclear whether the lobbyists believed that trivialisation was affecting science broadcasting, or whether they sought to associate with this political rhetoric, but this was the most effective method to date by which scientists sought to further their efforts to contest the editorial autonomy and authority broadcasters enjoyed over the production of popular scientific representations.

In July 1962 a BBC delegation was deputed to engage with the lobbyists and determine their criticisms so that broadcasters could formulate a response.[31] In discussions, it was revealed that the scientific community representatives felt that trivialisation was infiltrating into science programming because of a lack of coherence among science broadcasters. The solution for these lobbyists, was to integrate scientists into the structure of the BBC, so as to collaborate with science broadcasters at a production level, and to ensure that science programming was immune from the entertainment culture prevalent in contemporary British broadcasting.[32] Both executives and producers were called to provide first hand evidence to the negotiations and vigorously defended the identity and expertise of science broadcasters. PH Newby, Controller of the Third Programme, urged Assistant Director of Sound Broadcasting, Richard Marriott, to stress that there was "no substitute for the energetic science producer" who was expert in producing programmes that necessarily both attracted audiences and did no disservice to science.[33] Clow, as a senior science broadcaster, argued that their science programming was serving the BBC, science, and the public well, denying the charges of trivialisation.[34] The nature of the Pilkington report meant that concessions had to be made, despite broadcasters' reluctance to admit problems with their science broadcasting.

Over nearly two years from late 1962 to the summer of 1964, representatives of the BBC, Royal Society, BA and DSIR negotiated during regular meetings at Burlington House. Richard Marriott, on behalf of radio, and Stuart Hood, who replaced Adam as Controller of Programming on Television, most often represented the BBC during these negotiations and tried to end the recurrent problem. Marriott and Hood reported to Greene and fellow executives on their tactical efforts to resist change. In early 1963 the duo recommended that BBC executives and producers give the proposal of an advisory body a fair trial. Both Clow and Newby felt that the suggested Scientific Programmes Advisory Committee would be a waste of time. Marriott and Hood, however, viewed the idea of an advisory body as a compromise because it would avoid the "impracticable" appointment of a senior scientist at a senior BBC planning level, yet such a committee would portray the image of

[30] *The Guardian* 25 Sept 1962 p. 4.

[31] *BBC WAC* File T16/582/1: Minutes 24 Jul 1962.

[32] *BBC WAC* File R34/851/14: Notes for Report Oct-Dec 1962.

[33] *BBC WAC* File R6/239/1: Newby to Marriott 29 Oct 1962.

[34] Notes for Report Oct-Dec 1962, *op. cit*.

broadcasters' committed to improving science broadcasting but actually would have little production influence. Radio and television Directors endorsed this recommendation which meant that specialist science producers still listened to demand "from the public" rather than scientists in the formulation of their programming policy.[35]

It was, thus, their expertise in producing programmes that appealed to audiences that informed the policy of science broadcasters while the advisory body negotiations were proceeding. The early 1963 *The Cosmologists* television series, produced by Philip Daly of the newly formed Outside Broadcasts Features and Science (OBFS) department was designed to capitalise on the strong appeal of space science as a subject for the general public.[36] The series format was semi-personal interviews with celebrity astronomers such as Lovell and Fred Hoyle, with a complementary visual element provided by film of astronomical data images and equipment, such as helicopter shots of the Jodrell Bank telescopes.[37] Daly was overwhelmingly focused on audience reaction to his series. He was anxious when problems with coordinating the helicopter shot meant one programme was "not as dramatic" as planned. He was further concerned when he was "scooped" when Lovell appeared on an ITA programme just a few days before that particular programme in *The Cosmologists* series had been promoted and was aired.[38] His fears were unfounded, though, as the series met with much critical acclaim and approval from the scientific community. Above all, Daly was delighted that the general viewing audience warmly praised the broadcast.[39]

Yet, it was this same focus of science broadcasters on playing a key role in addressing the BBC's ratings crisis that justified the lobbyists' identification of trivialisation and a lack of coherent science broadcasting policy. Science writer Anthony Michaelis claimed that broadcasters, especially television producers, neglected science and science programming because of a focus on entertainment in the industry culture.[40] Science broadcasters knew of the problem but could do little to solve it in the competitive production culture, and did not reveal such weaknesses in the advisory body negotiations. Interdepartmental clashes for authority over and the identification of science programming expertise became increasingly common. The News team under Greene and former Television Talks producer Michael Peacock, the new Talks and Current Affairs division under Goldie, and the OBFS

[35] *BBC WAC* File R78/2729/1: Marriott and Hood to Greene 14 Jan 1963; File T16/582/1: Minutes 12 Feb 1963.

[36] *BBC WAC* File T14/1475/1: Heckmann to Daly 26 Dec 1962.

[37] *BBC WAC* File T14/1472/: undated memo by Daly; File T14/1475/1: Daly to Profs Heckmann and Burbidge's 21 Dec 1962.

[38] *JRUL SC JBA* File CS3/19/2: Daly to Lovell 14 Feb 1963. *BBC WAC* File T14/1475/1: Daly to Lovell 6 Mar 1963, Daly to Heckmann 30 Apr 1963.

[39] *BBC WAC* File T14/1478/1: Secretary to Daly to Mrs Fraser (publicity) 31 Jan 1963; File T14/1475/1: Daly to Heckmann 30 Apr 1963.

[40] *The Guardian* 29 Jan 1963 p. 6.

section under Singer, Richard Francis and Peter Dimmock, all sought priority for science broadcasting. The conflict between these departments surfaced with planning for the BBC's coverage of the orbital flight of US astronaut Gordon Cooper in May 1963. BBC editors, managers and directors undoubtedly favoured the News team, but the Talks and Current Affairs department housed most science broadcasting expertise, while the OBFS team argued that only they could supply the depth of knowledge required to handle live coverage of such major events. In the end, Greene ruled that the three divisions should cooperate on this occasion and in future science programming.[41]

This cooperation did not happen because of the departmental value of supplying science programming that would allow the BBC to compete in its ratings war. The three divisions sought for priority and authority over science programming by consolidating their team's science broadcasting expertise.[42] Television Talks and Current Affairs, particularly within its traineeship scheme, was especially rich in science broadcasting experience but the proportion of schedule space devoted to its more didactic output was falling. The burgeoning OBFS team under Singer and spearheaded by Daly was strengthened by the addition of specialist science producers Robin Reid, Raymond Baxter, and James McCloy who had transferred from Talks, and the implementation of its own apprenticeships to complement its existing science reporters Ben Boltz and Gordon Rattray Taylor who had joined the BBC in 1958. Later, the OBFS team would contain science broadcasters who specialised in making films about specific fields of science, such as physics, as Lovell was informed in production correspondence.[43] The News division also strengthened its specialist expertise when David Wilson joined Aerospace Correspondent Reg Turnill as the Science Correspondent for BBC Television News.[44] Wilson was recruited as a broadcast science journalist, a science reporter for a broadcasting organisation rather than a newspaper, and had a distinctly different professional science broadcaster identity and expertise from producers who specialised in science programming.[45] Even within the News team, there was some contesting of territory between Turnill and Wilson regarding radio and television coverage of space science and exploration. Similarly, the problems of science broadcasting remained inter-medium. Clow admitted that the Radio Science Unit, formed with the radio astronomer and Talks producer David Edge in 1959, was being seriously marginalised by the attractiveness of television for science communication. Clow

[41] R Turnill (2003): 79-87.

[42] *BBC WAC* File R78/2696/1: SCG report 6 Nov 1964.

[43] *JRUL SC JBA* File CS3/19/2: Reid to Lovell 30 Dec 1968.

[44] *DWPC* (Misc.): H Casey to Wilson 16 Dec 1955, Contract for employment with BBC 28 Feb 1958, NS Holmes to Wilson 25 May 1959, Denis Morris to Wilson 28 May 1959, Asst. Admin Officer, News (Sound) to Wilson 14 Feb 1963, Tony Ashton to Wilson 14 Feb 1963, Wilson to AAON (S) 18 Feb 1963, Undated proposal 'A Television Evening Paper'.

[45] *DWPC*: BBC Retirement Book; (Misc.): Rattray Taylor to Wilson 15 Dec 1965, Wilson to Dr Gyles Glover 14 Mar 1980.

noted that the aim of radio science broadcasters, now, was to "provide entertainment defined in terms of the largest obtainable audience" for their programming in order to compete with television science.[46]

In the meantime, and in denial of these science broadcasting problems, Greene, Hood and Marriott, on behalf of BBC executives and producers, had gone about constructing this advisory body as a form of 'informal machinery' with no production oversight. This machinery ignored problems with the BBC's science broadcasting in negotiations, so that scientific representatives would agree to leave science broadcasting to the broadcasters but without straining relations.[47] Greene invited the heads of the major scientific institutions to submit their recommendations for membership of the advisory body.[48] However, Marriott told Hood of his suspicion of the lobbyists' "intentions to exercise undue influence" by nominating representatives who were keen to challenge the production authority of broadcasters. Clow and Singer were invited to nominate their preferred candidates, scientific expert 'topliners', but those who were prepared to acknowledge the professional expertise of science producers.[49] In addition, BBC representatives delegated to the negotiations had no policy influence. In this way was the advisory board constructed such that it would neither identify extensive problems nor seek to solve them through widespread changes or interference.

The Science Consultative Group (SCG) was finally incorporated in the spring of 1964.[50] Following an April 1964 meeting, Pendlebury, the Secretary to the BBC's Advisory Bodies, reported to Grisewood that it had been agreed that the Group be established as a forum for the interchange of ideas, but also, and significantly, that they would consider "BBC's function and policy as a communicator of scientific and technological information" as well as commenting critically on programmes broadcast. The Constitution and terms of reference formulated on the 13 May echoed this agreement, though adding that the proceedings of the Group should be regarded as "an experiment in consultation", with the option to review its progress.[51] However, the announcement to the Press Agencies on the Group's formation, drafted by Pendlebury and promoted by the Press Officer Margaret

[46] *BBC WAC* File T16/582/1: Anon paper on 'Position of a Science Unit' 10 Oct 1963; File R78/2696/1: SCG report 6 Nov 1964.

[47] *DWPC* (Misc.): Newspaper cutting 10 Feb 1971 by Adam.

[48] *BBC WAC* File T16/582/1: Greene to representatives 13 Mar 1963.

[49] *BBC WAC* File R78/2729/1: Marriott to Hood 11 June 1963; File R6/239/1: Clow to Singer 20 Dec 1963.

[50] Engineering, industrial and computing factions attempted to form equivalent lobby and consultative groups, but were less successful, because of a failure to convince broadcasting producers and executives that their disciplines had material of sufficient newsvalue. More detail can be provided if needed, with evidence to be found mainly in *BBC WAC* Files on the Science Consultative Group.

[51] *BBC WAC* File R78/2729/1: Pendlebury to Grisewood 24 Apr 1964; File T16/582/2: Constitution and terms of reference 13 May 1964.

Bayley, was subtly but importantly different. This announcement was the most significant method by which BBC representatives sought to demonstrate their commitment to engaging with the lobbyists' criticisms and improving science broadcasting, but with the minimum of disruption to, and interference with, the professional authority and identity of broadcasters. The press release stressed the supplementary consultative nature of the SCG, and made no mention of consideration of the BBC's science production policy.[52]

A note to Adam on the SCG's incorporation stressed that the new consultative body could not and would not seek to challenge or undermine the expertise of science broadcasters in producing programming that audiences wanted to listen to and watch.[53] There were some voices of dissent among scientific representatives of the SCG, in relation to how the remit of the Group had been reduced so that the autonomy of producers could not be questioned. Stafford Beer, the management cybernetician, criticised broadcasters' claims of "closer liaison with the scientific world", and viewed the resultant SCG constitution and publicity as a way for BBC broadcasters to demonstrate their commitment to avoiding trivialised science programming without allowing the scientific community a mandate to ensure this. Richard Aaron, the Welsh philosopher, questioned the steps being made towards formulating a coherent science broadcasting policy and overcoming science broadcasters' concern with ratings more than science.[54] However, it was largely agreed in SCG reports and meetings that science broadcasters, as a specialist media resource, were ultimately subject to the demands of broadcasting culture. This culture stressed entertaining the audience above educating and informing it if the BBC was to compete for national and international audiences. Science broadcasters were so valuable because they were expert in providing programming that could both attract mass audiences and, in the process, educate and inform them. Overall, though, now, science broadcasters identified more closely with the tenets of "communicability, interest and significance" rather than the Reithian ideals in their production policy.[55]

The SCG, alongside occasional more formal interdisciplinary meetings, facilitated rapport that certainly helped defuse cultural tensions between broadcasters and scientific community lobbyists. Originally, broadcasters had hoped that the Group would be disbanded after its trial period of two years. However, in late 1965 it was largely conceded that their fears at inaugurating such an advisory body had been unfounded, and that it should not be disbanded. Jose Camacho, the Head of Talks and Current Affairs in Sound, and Pendlebury wrote to Greene and senior BBC executives that the SCG had been a

[52] *BBC WAC* File R6/239/2: Draft press release by Pendlebury 26 May 1964; File T16/582/1: Bayley to Press Association, Exchange Telegraph, etc 28 May 1964.

[53] *BBC WAC* File T16/582/1: Notes for Adam 28 May 1964.

[54] *BBC WAC* File T16/623: History of Broadcasting Volume V (1955-64) p. 24-31.

[55] *BBC WAC* File R78/2696/1: SCG report 6 Nov 1964.

valuable addition. Rather than focusing on the minimal practical advice gathered from the SCG, Camacho and Pendlebury emphasised the "goodwill" that had resulted between delegates. They both recommended the continuation of the SCG so as to prevent a repeat of the Pilkington criticisms, even if there would be some extra work for their science broadcasting staff.[56] In addition, producers understood that cordial relations with scientific experts remained crucial for ensuring accuracy in programming. Singer and Daly, for example, viewed Drs Alan Hunter and Olin Eggen from the Royal Observatory as "key to maintaining a responsible level" in their *Mariner IV Looks at Mars* show in late 1964.[57] The Mariner programme conducted by NASA launched a series of robotic interplanetary probes designed to investigate Mars, Venus and Mercury. Mariner 4, launched on November 28, 1964, was the first successful flyby, and gave the first glimpse at close range, of Mars. In the process, scientists retained a form of 'associative' production influence in that television producers were keen to convey and structure a view of science that the elite 'voices of science' approved of even whilst it repulsed their control at a higher level.[58]

Because the SCG was constructed as a figurehead board to preserve the autonomy of science broadcasters the problems of science broadcasting were not addressed. These problems of a lack of coherent science programming policy and organisation impacted on the *Mariner IV* production. The Television Talks and Current Affairs and OBFS divisions both hoped to cover the probe's arrival at Mars. Singer was furious that his team was "scooped" by *The Sky at Night*. Singer sought to undermine their rivals' output, arguing to executives that it tended to be inaccurate despite Moore's best commentator efforts, and that *Horizon* should have had the opportunity and "responsibility for *reporting* on it", but the programme was aired nonetheless.[59] The contest for the authority and responsibility for housing the BBC's science broadcasting expertise was becoming fierce.

The OBFS, reorganised under Singer, was especially boosted by the recommendation of the Pilkington Committee that the BBC begin broadcasting on a second channel and became the home for virtually all significant coverage of science. Yet, television science broadcasters had largely converged on a set style. The difference between a studio-based Talks programme with some film and Outside Broadcasts inserts, and an Outside Broadcasts programme from a venue converted into a studio using similar inserts, was unlikely to have been very obvious to viewers. Launched in April 1964, BBC-2 allowed science broadcasters to implement the requirement of the Pilkington recommendations that the BBC increase the quantity of science output, which had been limited up this point

[56] *BBC WAC* File R6/289/1: Pendlebury to various 1, 11 and 12 Oct 1965, Camacho to various 11 Oct 1965; File T16/582/2: controllers meeting minutes 1 June 1965.

[57] *BBC WAC* File T14/3290/1: Daly to Woolley 19 Jul 1965.

[58] Boon, *op. cit.*, pp. 221-224, 235-240.

[59] *BBC WAC* File T14/3290/1: Singer to Cave 4 and 11 Dec 1964 (original emphasis).

by the requirement that the single channel serve all interests. In addition, BBC-2 offered science producers the opportunity for experimentation, especially with the support for science programming of its first two controllers, Peacock and David Attenborough. In the channel's opening roster, Singer and his team resurrected Daly's 'magazine' series idea with the science documentary *Horizon*, reflecting an important shift in current affairs that began to question the authority of science. In July 1965 *Tomorrow's World* was first aired, comprising film, outside broadcasts and studio reports with the aim of attracting a larger audience to science programmes.[60]

However, it was not all advance for science broadcasters, despite the popularity of these new genres with audiences. The threat to the autonomy of science broadcasters had been resisted, but a lack of a coherent policy remained. In addition, the SCG negotiations had sustained and highlighted the scientific sympathies and susceptibilities of science broadcasters. The growing tendency in the media to criticise and challenge the social authority of science as a reflection of popular opinion became a conflict of interest for science broadcasters. Science broadcasters had to openly commit to serving the interests of broadcasting as specialist industry resources that produced programming and programmatic material that was of value in competing for audiences. Those that did not commit to this identity were marginalised. Those that did also found themselves marginalised when popular ambivalence meant that the ratings value of science programming lessened. Science broadcasters, as specialist producers and journalists, understood that that science programming, and, therefore the demand for their expertise, was subject to the "mercy of fashion".[61]

At the mercy of fashion: The 'problem' of science in the broadcast media

In the middle 1960s, popular interest in science remained high, particularly in the culmination of the space race. Consequently, there remained an audience demand for science programming. Science broadcasters, thus, remained key resources in the broadcasting industry, enjoying a significant production identity and authority because of their expertise in producing programmes on science that occupied key positions in schedules and the competition for viewers and listeners. However, the consolidation of the science broadcaster profession that had proceeded over the preceding thirty years was coming to an end. The specialist expertise of science broadcasters was not in question, but a number of contingent factors were combining to limit the status of their profession.

[60] Boon, *op. cit.*, pp. 214-219, 225-230.

[61] *BBC WAC* File R78/76/1: Minutes 29 May 1964.

First of all, interdepartmental rivalries for production territory regarding science programming were becoming destructive and impacting upon the BBC's bid to compete with external rivals for audiences by affecting production coherence. Aubrey Singer and his OBFS team, in particular, were aggressive in claiming the authority and expertise for science broadcasting, especially following the successful launch of magazine shows *Horizon* and *Tomorrow's World*. Singer's division had overtaken Television Talks and Current Affairs as the primary home for specialist science producers, but also sought to develop their responsibility for broadcast science journalism. For example, Glyn Jones, then editor of *Tomorrow's World*, charged Cave with supplying him with the latest original research in the form of daily newspapers, magazines and periodicals that could be used to form the basis of science news stories.[62]

Singer encouraged producers and programme editors in OBFS to take responsibility for reporting science news away from the News department. Singer also regarded space science as the most valuable material for demonstrating the expertise of the OBFS team in science programming. Having missed out on the earlier Mariner opportunity, Singer began to cultivate space science contacts to secure notice of important space age news. Singer emulated the News division's Turnill, Wilson and Colin Riach, the assistant science and air correspondent, in building contacts at the NASA PR office to keep abreast of developments in the space race.[63] Similarly, OBFS producer Peter Ryan was charged by Singer to research plans for the 'soft landing' of a television camera on the moon by the US Surveyor probe in October 1965. Singer also asked Ryan to contact his previous acquaintance Lovell to look into a potential rival Soviet Luna attempt to potentially broadcast the latest pictures of the moon received at Jodrell Bank as a "possible live spectacular for BBC 2", though suggested perhaps waiting for a second, more guaranteed, attempt.[64] In addition, Jones wrote to his *Tomorrow's World* editorial successor Raymond Baxter proposing an Outside Broadcast from Goonhilly Satellite Earth Station – a telecommunications site in Cornwall at one time the largest satellite earth station in the world - relating to the test of the Soviet communications satellite Molinya, from which he suggested that they try to extract "maximum value".[65] Cave and Max Morgan-Witts, then editor of *Tomorrow's World*, were explicit in revealing that the aims of the OBFS division was to position itself as best placed to cover the prized space race events. Cave told Peacock that eventually something unexpected would happen on a spaceflight, and the *Tomorrow's World* team wanted to make preparations so as to be able to go on the air with "a crash programme should anything sensational develop".[66] Likewise, Morgan-Witts argued to Singer that *Tomorrow's*

[62] *BBC WAC* File T14/2950/1: Jones to Cave 13 Oct 1965.

[63] *BBC WAC* File T14/2950/3: NASA press release to Singer Jul 11 1966; File T58/563/1 US Space Flights 1965-68.

[64] *BBC WAC* File T14/2950/1: Ryan to Singer 11 Oct 1965.

[65] *BBC WAC* File T14/2950/1: Jones to Baxter 28 Apr 1966.

[66] *BBC WAC* File T14/2950/3: Cave to Peacock 4 Mar 1966.

World should position itself as best placed to remedy the Corporation's deficiency in coverage of Soviet space activity.[67]

On occasion, Singer's OBFS team's enthusiasm to become the BBC's prime contractor for science programming of all genres overstepped the mark of professionalism. R Noble, a Chief Assistant in Television Talks and Current Affairs, had to warn OBFS producer and editor of *Horizon*, Robin Reid, that the zealousness of his staff to secure space-race material had gone too far. Noble told Reid that *Horizon* staff had sought the "first print" of a spaceflight film by denying that Peter Ryan, on secondment to the Current Affairs team, worked for the BBC.[68] Executives, on occasion, had to rule on such disputes. Peacock, Controller of BBC-1, told Singer that if the October 1966 unmanned *Apollo* splashdown occurred on a Wednesday, then the Head of the Current Affairs Group on Television, at that time Fox, would be glad to make this material available for a *Tomorrow's World* special (normally broadcast on a Thursday), but if this event fell on any other day it would be handled as a *24 Hours* special as had been the case in previous shoots. Singer told Peacock that he felt the decision was "puzzling, disappointing and worrying", especially given the responsibility bestowed upon them in terms of their departmental name, but accepted that departmental demarcation lines had to be made somewhere with regard to the incoherence of science programming.[69] Singer was convinced that one reason for this ruling was that the OBFS did not stake a claim to covering this event quickly enough because they were waiting until they "knew definitely that there was to be a television camera" on board the flight. Singer urged Morgan-Witts to redouble their efforts and overcome his "misgivings about expending so much money and effort" on *Apollo* specials so as not to be outdone again.[70]

Such interdepartmental acrimony was exacerbated by the convergence of OBFS science broadcasting and News division broadcast science journalism. In late 1965 and summer 1966 SCG meetings, OBFS producers and editors emphasised that their magazine programmes must "adopt something of a journalistic approach".[71] The justification for the adoption of this approach was the success of science journalism among rival broadcasters and rival media. Wilson warned Cave that he had heard informally that the ITA franchise ATV was producing a similar magazine series, with the help of the *New Scientist* and *Sunday Times* science journalist Tom Margerison. Wilson also noted that this series was aiming at the widest possible audience by embracing a more public affairs stance.[72]

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[67] *BBC WAC* File T14/2950/1: Morgan-Witts to Singer 12 Sept 1966.

[68] *BBC WAC* File T58/565/1: Noble to Reid late July 1966.

[69] *BBC WAC* File T58/565/1: Peacock to Singer 19 Oct 1966, Singer to Peacock 21 Oct 1966.

[70] *BBC WAC* File T14/2950/3: Morgan-Witts to Singer 24 Oct 1966.

[71] *BBC WAC* File R6/289/1: Minutes 19 Nov 1965; File R78/76/1 Minutes 2 June 1966.

[72] *BBC WAC* File T14/2950/1: Wilson to Cave 3 Apr 1967.

Morgan-Witts, then editor of *Tomorrow's World*, agreed that OBFS output would have to improve and expand its magazine output if it was also to counter the "boom in science coverage" in terms of science journalism in the popular press and magazines.[73] Such a strategy was designed to enable OBFS to reflect and engage with popular attitudes to contemporary issues including science that were becoming more critical in a form of campaigning journalism within a social documentary.[74]

The ad hoc adoption of a more critical and journalistic policy by allied science broadcasters was of concern to the SCG. Singer later argued to the SCG that it was "right for a programme aiming to attract a large audience in peak hours to concern itself with the results and social implications of scientific developments", because that was what the audience wanted.[75] Even coverage of the moon landings was offset by a *Panorama* discussion on the benefits of space exploration that asked whether the costs were justified at the expense of terrestrial problems.[76] In general, though, television science tended to reinforce the legitimacy and sacredness of science: it was critical for science broadcasters to maintain the status of science in their programming, as that status legitimised not only the content but also the specialist producers and journalists themselves.[77] Of even more concern to scientific representatives on the SCG was that the importance accorded to the traditional, more 'responsible' form of science broadcasting by broadcasters was waning. I argue that a similar development occurred as happened in science writing, namely that as science broadcasters found their expertise was in demand in the space race, that they allowed their scientific susceptibilities to surface, rather than focusing on the audience. For a time they acted more as scientific broadcasters, evidenced in the fact that they embrace the necessity of magazine programmes but that they do not wish to aggressively critique science. As a consequence of a conflict of interest with their broadcasting colleagues the status accorded to science broadcasters and their output as a valuable resource was reduced.

As broadcasters, science broadcasters and broadcast science journalists understood that neither science programming nor science broadcasters were afforded any privilege. Wilson reminded the SCG that science programmes had to win their own place in the schedules on "grounds of interest and significance", or, in other words, audience figures.[78] On such criteria, *Tomorrow's World* editors struggled to justify its prime time slot, with Peacock warning Singer that his show was impacting negatively on their ratings competition against

[73] *BBC WAC* File T14/2950/4: Morgan-Witts to Singer 6 Feb 1967.

[74] J Bennett (1999): 159-162.

[75] *BBC WAC* File R78/76/1: Minutes 16 May 1969.

[76] *BBC WAC* File T58/410/1: John Gau to panellists 14 Jul 1969.

[77] S Dunwoody (2008): 18-21.

[78] *BBC WAC* File R78/2696/1: report by Wilson 19 Apr 1966.

ITV.[79] Garratt appealed to Lovell to use his influence to emphasise the importance of science programming to BBC directors and managers who, he claimed, did not "believe in science at all", though this was perhaps an overstatement of the focus of broadcasters on ratings and entertaining the audience.[80] In the late 1960s, on the "balance of audience interests and demands" it was clear that science programming, even news of the space race, in its existing form could no longer justify extensive or prime schedule space.[81]

Science broadcasters did feel the effects of the lessening importance of their science programming as a threat to the security of their identity and authority. Certainly, the lessening audience demand for existing science programming reduced the demand for science broadcasting experts. Both Swallow and Singer sought to formalise the policy of science broadcasters in order to emphasise their commitment to, and expertise in, specialist broadcasting rather than science, such that they could continue to produce programming that was competitive. Swallow emphasised that the function of producers and journalists specialising in science in broadcasting was to translate science into "the technical language of television" and make good radio.[82] Similarly, Singer stressed the "story-telling function" of science broadcasters in representing science in a way that provided for and enriched their audience's demands and interests, and argued that their output could be considered against the merits and popular appeal of other types of programming for schedule space of "inestimable" value. Singer argued that the broadcasting, and especially televising, of science was subject to the climate of public opinion, the principles of programme structure and the demands of dramatic form, with priority "given to the medium" in terms of representation rather than scientific pedantry.[83] Such efforts did help to institutionalise science broadcasters but their eagerness to be identified as specialist mediating resources also meant that science broadcasters were ultimately subject to the fickleness of audience demand for science programming.

The newsworthiness of the *Apollo* missions provided science broadcasters with a timely boost, with producers in rival divisions also largely collaborating on providing comprehensive BBC coverage of the moon landings that would seek to capitalise on the "great public interest" and capture a significant audience share.[84] Executives were keen to continue to the trend of the BBC performing "better on the big occasions", especially with ITN investing heavy in their flagship broadcasts under active science broadcasters such as

[79] *BBC WAC* File T14/2950/3: Peacock to Singer 12 Dec 1966.

[80] *JRUL SC JBA* File CS3/19/2: Garratt to Lovell 29 Aug 1967.

[81] *BBC WAC* File T47/222/1: Minutes 8 Nov 1968.

[82] N Swallow (1966): 140-163.

[83] A Singer (1966): 3-6, 15-18.

[84] *BBC WAC* File T58/565/1: Noble to Fox and Scott 6 May 1969.

Peter Fairley.[85] Singer did launch one last attempt to capture all science broadcasting and broadcast science journalism within the remit of OBFS to gain the authority and priority for covering historic events. Singer, Noble Wilson, chief assistant in the Features Group, and Humphrey Fisher, who succeeded Singer as the Head of Science and Features, sought to frame the event as 'scientific' and, thus, as within their territory which contained most expertise in the genre. The OBFS representatives argued to Paul Fox, then Controller BBC-1, and Director of Television, Huw Wheldon, that as much of the research and technical details for the BBC's space race output was being provided by the *Tomorrow's World* team, rocketry and space exploration should be dealt with as a "scientific and technological matter rather than current affairs" or even news.[86]

The problems of science broadcasters continued in the post-*Apollo 11* years, and their progress stalled. Wilson stressed that it was not impossible for science programming to make the schedules on such judgments, but, at the least, science programming was no longer assumed to be automatically worthy of resources or schedule space, despite its public service aspects and televisual appeal.[87] The disadvantage of defining the profession as an industry resource was that it was accorded no privilege. Only for the drama and potential tragedy of *Apollo 13* could public concern be assumed. Richard Francis of the News team noted that audience figures for *Apollo 16* disproved the theory that people were bored with the moon landings, but this audience interest can be largely attributed to the fact that this was the symbolic final moon mission.[88] Two aspects motivated the construction by scientists of the 'problem' of science in the broadcast media. Sympathetic science broadcasters were marginalised, and those who committed to demonstrating a commitment to and expertise in media culture were so tied to audience whim, and, thus, had no privilege when audience interest in science, and science programming, began to wane. It was only at this time that tensions between scientists and broadcasters re-emerged, particularly concerning the social duty and responsibility of broadcasters to broadcast science, as Singer and Adam both later testified.[89] Science on television and radio was no longer as frequent or unquestionably positive and was a threat to the social authority of science. Science broadcasting and broadcast science journalism, though, did remain valuable latent resources in the BBC's competition for audiences. One other factor related space science and broadcasting competition for audiences in this post-Sputnik period: the development of the space technology of satellite communications. Satellite

[85] *BBC WAC* File T47/85/1: news and current affairs meeting extract 10 Jan 1969.

[86] *BBC WAC* File T47/85/1: Singer to Wheldon 18 Feb 1969, Singer to Fisher 3 Feb 1969, Fisher to Fox 9 Jan 1969, Wilson to Fox early 1969.

[87] *BBC WAC* File R78/76/2: Minutes 8 Nov 1974.

[88] *BBC WAC* File R34/1219/2: David Lloyd James, Head of Radio Presentation, to all continuity announcers 15 Apr 1970; File R78/2, 521/1: news and current affairs meeting extract 5 May 1972.

[89] A Singer (1966): 7-12. *DWPC* (Misc.): Newspaper cutting 10 Feb 1971 by Adam. For a summary see also: *BBC WAC* File R4/119/1: May 1975 report.

broadcasting, however, would only exacerbate the BBC's and British broadcasters' woes in a global era.

The BBC and space technology: Exploring the potential of satellite broadcasting

The orbit of Sputnik convinced global policymakers and lay publics that Soviet space technology was world-leading. Beyond this worrying development in the Cold War, though, Sputnik was a rudimentary demonstration of communicating via space. At first, satellites launched by the superpowers were military in design, though, in 1958, President Eisenhower used Project SCORE (Signal Communications Orbit Relay Equipment), the world's first communications satellite or relay system built by the US Department of Defence Advanced Research Projects Agency, to broadcast a recorded Christmas message around the world as a political and ideological stunt. In the years following Sputnik, I argue that broadcasters globally recognised and actively pursued the potentially revolutionary implications of satellite communications on media technologies of production and distribution.[90] At the BBC, for example, Patrick Moore featured Sputnik in the 19 October 1957 edition of *The Sky at Night*. In the programme Moore discussed the potential implications of satellite technology, including using space relays to transmit information across the globe via space rather than via cable.[91]

British broadcasters quickly made the connection between potentially transmitting information globally and potentially broadcasting programmes to global audiences. Yet, broadcasters at the BBC and ITA also understood that even terrestrial broadcasting was not without its problems. In 1959, the Television Talks team, the division most associated with pioneering science programming in the BBC, hoped that it would be able to exploit the European Broadcasting Union (EBU or Eurovision) system to increase the potential audiences for their output. However, Television Talks producer John Grist told his departmental head Leonard Miall that they would not be able to engage with the EBU system without heavy costs. Grist added that European communications had "become more involved and difficult" rather than simpler.[92] Compared to European broadcasting, space communications technology was still in its technological and administrative infancy.

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[90] As opposed to existing literature on the effects of satellite communications on the broadcasting media which largely dismisses the first twenty-five years after Sputnik, instead concentrating on the 1980s when cable and services broadcasting direct to the home were developed. See, for example: Crisell, *op. cit.*, pp. 213-217.

[91] *BBC WAC* File T32/1859/1 The Sky at Night: November 1957 script.

[92] *BBC WAC* File T32/1184/3: Grist to Miall 10 Mar 1959; Goldie to various 17 July 1959.

In addition, Hugh Burnett of Television Talks noted that it was difficult enough to incorporate even telephony into domestic and terrestrial programming, never mind live satellite feed.[93]

Undeterred by hurdles with supposedly more straightforward broadcasting techniques and approaches, satellite-minded broadcasters at the BBC and ITA established contact with relevant centres of authority in order to consolidate the links between space communications and broadcasting technology. In fact, the hope was to encourage the application of developments in space communications to improving broadcasting technology. Bernard Lovell at the Jodrell Bank radio astronomy observatory was frequently approached by broadcasters, especially given the role of the iconic Lovell telescope in confirming and tracking the orbit of Sputnik's carrier rocket. In responding to a query from an ITA representative, Lovell stated that although Jodrell Bank's ionospheric work was not "specifically directed to the problems concerned with television transmissions", it could be regarded as part of the fundamental research effort on such problems.[94] In addition, progress in satellite broadcasting and space communications technology was encouraged through programmatic rhetoric.[95]

Broadcasters used audience demand for science programming and their production authority to place emphasis on the broadcasting applications of satellite technology. For example, in one of Lovell's 1958 Reith lectures, the Jodrell Bank telescope was used to bounce 'hellos' off the moon. Producers foregrounded an experiment in space communications that the telescope was not designed for. In addition, when the lectures were repeated on the Overseas Service the following year, producer Margaret Lyons persuaded Lovell to extend his discussion to the implications of the work of Jodrell Bank outside the strictly scientific field, including for the future of broadcasting.[96] In establishing contact with experts in the field and in embedding programmatic rhetoric, these broadcasters were attempting to explore and exploit the opportunities provided by Sputnik to galvanise public interest in, domesticate and encourage satellite communications developments.[97]

Though the potential of satellite broadcasting to create and reach new audiences with programming had been widely recognised by British broadcasters, neither the BBC nor the ITA formulated any specific policy to develop this potential because of the minimal

[93] *BBC WAC* File T32/1184/5: Burnett to Goldie 30 Sept 1961.

[94] *JRUL SC JBA* File CS7/39/5: Miss Miller (Sec. to Mansfield Cooper) to Lovell 8 Jan 1959.

[95] The same was true of newsreel producers at British Pathé who covered the latest transmissions experiments. For example: *British Pathé* 1961.

[96] *JRUL SC JBA* File CS3/19/1: Lyons to Lovell 25 May 1959.

[97] M Collins (2005): 120-121, 123.

technical progress in the field. However, in September 1959, the BBC Scientific Advisory Committee (SAC), under the ionospheric physicist Sir Edward Appleton, delivered an end-of-decade report to the BBC Chairman, Arthur fforde. Appleton and SAC members were well placed to advise the BBC's Board on satellite policy given their responsibility for advising on "the BBC's scientific research and its correlation with external activities in the same field". The SAC Report stated that the BBC's pioneering work in developing broadcasting techniques and technology had been of "great national importance". The Report added that it was no exaggeration to say that the technical development of broadcasting was "largely the technical development of the BBC itself" through its scientific and engineering staff. However, the SAC statement ended with a warning that advances in space science and satellite technology as applied to broadcasting were progressing outside of the BBC and Britain. Appleton recommended that broadcasting executives implement a policy that would enable the BBC to "continue to extend its status" and retain its pre-eminent status in a global broadcasting marketplace.[98] Appleton's conclusions encouraged producers and executives to focus their efforts towards positioning the BBC as a central provider and supplier of satellite broadcasting.

Being a central provider and supplier of satellite broadcasting would mean that the BBC was able to cover the major events of the day on their own terms. In the early 1960s, the space race was intensifying and entering the astronautical phase. Certain BBC producers and executives were motivated by the SAC Report and hoped to broadcast dramatic Soviet and, in particular US, manned exploration efforts live using their own resources, facilities and infrastructure, rather than relying on cabled or ground-relayed 'feed' from external partners. March 1961, for example, saw the BBC broadcast the relayed historic first East-West television transmission of Yuri Gagarin's triumphant homecoming parade in Moscow following his becoming the first man in space. Aubrey Singer, the Head of the Outside Broadcasts and Features Department and keen science broadcaster, was certainly eager to explore the potential of relaying his division's programmes to wider audiences, including via space. The month after Gagarin's broadcast Singer wrote to Lovell hoping that the researchers and their equipment at Jodrell Bank would be able to help him and the BBC "surmount the last geographical frontier" in receiving a television picture from the US. However, as Lovell reported to Singer with apologies for being unable to help in his experiment, there remained extensive technical hurdles in making global broadcasting, especially via space, a reality.[99] Consequently, when the News and Current Affairs team sought to broadcast the May 1961 US *Mercury 3* flight, in which Alan Shepard became the first American in space, Foreign Editor Anthony Wigan decided that the BBC would accept

[98] *BBC WAC* File R6/185/2: SAC 4th Report September 1959.

[99] *JRUL SC JBA* File CS3/19/1: Singer to Lovell 10 Mar 1961.

and purchase the American National Broadcasting Company's (NBC) coverage, interweaving their own commentary subsequently.[100]

A lack of technological progress and definitive policy were not the only stumbling blocks for those convinced of the necessity for the BBC to be active in satellite broadcasting in order to remain competitive in terms of capturing audiences. Satellite-minded producers and executives also encountered pessimism among their colleagues regarding the administration of satellite broadcasting if and when scientific and engineering advances brought about the possibility. GHG Norman, Assistant Foreign Editor in the News team, for example, raised the issue of the legalities of satellite broadcasting from space.[101] Anthony Jay, Assistant Editor on the Current Affairs department's magazine programme *Tonight*, argued to satellite-minded Head of Television Talks and Current Affairs Grace Wyndham Goldie that it would be "impossible for global television to be anything more than a phrase", apart from link-ups for big events. Jay, like many of his colleagues, based this judgment on the basis of experiences of domestic network conflicts with the EBU.[102]

Goldie was unwavering in her enthusiasm and challenged her staff such as Jay and Burnett to identify ways to advance the cause of satellite broadcasting. Burnett suggested that the required technical improvements would not be made until the problem was "raised to much higher levels within the BBC", and in cooperation with partners such as the ITA. Jay proposed the idea of a 'World Television Day', one day each year in which all the nations with television services abandon their domestic services for a worldwide hook-up. Not only would this act as a form of satellite advocacy but Jay felt that if the originate and sponsor the idea, its position "as a leader of world television" could be reinforced.[103] In addition to Singer and the Outside Broadcasts and Features team, and Goldie and the Television Talks and Current Affairs department's hopes of finding new audiences for their programming, the News division had a vested interest in satellite broadcasting to be able to cover the major space age news.

In early 1962, science correspondent David Wilson was charged with strengthening the in-house space communications technology expertise and evaluating its potential value in terms of improving the BBC's programming and, thus, ability to compete for audiences.[104] Wilson dampened any ambitious expectations by stressing the heavy costs and complexity of transmissions via space and, worse still, their unpredictability and unreliability. Wilson did not recommend for BBC producers and executives to seek to construct and use satellite

[100] *BBC WAC* File R28/309/1: Wigan memo 24 Apr 1961.

[101] *BBC WAC* File R34/1118: undated memo by Norman.

[102] *BBC WAC* File T32/1184/5: Jay to Goldie 6 June 1961.

[103] *Ibid.*, Burnett to Goldie 30 Sept 1961.

[104] *BBC WAC* File R34/1118: Rooney Pelletier to various 26 Feb 1962, memo by Singer 18 May 1962.

systems to cover events, such as space launches, on their own terms, because it would be exceedingly expensive, and would not be guaranteed to improve, and could potentially detract from, the quality of programming and audience retention. Wilson concluded that, in his opinion, adequate administration and infrastructure was not yet in place for satellite broadcasting to become cost-effectively viable, and that the BBC should continue to cover news such as of the *Mercury* programme by purchasing broadcasts from overseas networks that could be cabled or ground-relayed across.[105]

BBC executives endorsed Wilson's report because subsequent coverage of the US spaceflight programme was conducted according to his recommendations as to the most cost-effective strategy, especially given that even telephone and cable facilities remained inadequate for reporters, being saturated, poor-quality and expensive. For John Glenn's historic *Mercury 6* orbital spaceflight in February 1962 and Scott Carpenter's follow-up flight in May 1962, Wilson anchored BBC coverage for television and Reg Turnill, the aerospace correspondent, for radio, both in London studio shows.[106] This strategy paid dividends, as *Tonight* programmes devoted to the missions captured thirteen million viewers because of the new live footage from the *Mercury* missions relayed and incorporated into the productions.[107] Despite the cost-effectiveness of being a consumer of broadcasts cabled and relayed across the Atlantic, satellite-minded producers and executives never lost sight of the hope that the development of space communications and transmissions technology and infrastructure would allow the BBC to supply audiences with programmes covering the major space age events on their own terms.

This hope was promoted and encouraged through a specific, explicit focus on satellite broadcasting in space science programming, in order to domesticate the notion with audiences who would then demand its political and technical realisation. For example, the June 1961 Home Service programme, *The British in Space*, profiled the British Interplanetary Society (BIS). In this programme, both BBC producers and BIS representatives had a vested interest in promoting British space policy expansion but for different reasons. BIS Fellows hoped to bring about extensive space exploration while satellite-minded producers sought to emphasise that spin-offs from such space efforts would, it was hoped, "open a new field of achievement for BBC engineers and offer more immediate news services for audiences".[108] This focus on promoting the benefits of an active British satellite policy continued in the major joint Outside Broadcasts, News, Talks

[105] *BBC WAC* File R28/309/1: Wilson to various 27 Feb 1962.

[106] *BBC WAC* File R28/309/1: Norman to sound executives 22 Feb 1962; File R44/836/1: Margaret Bayley memo 25 Jan 1962.

[107] *BBC WAC* File R44/836/1: Tony (Reuters) to Carleton Greene 21 Feb 1962, George Campey to John Cawley 9 Mar 1962.

[108] *BBC WAC* File R19/2091/1: Script; Transmission 27 Jun 1961 Home Service; René Cutforth to Mr Chabot 5 Jul 1961; Carter recommendations 12 Jun 1961, Francis Dillon to Miss E Wakeham 26 June 1961 (contracting).

and Current Affairs production celebrating the launch of *Ariel 1*, Britain's first satellite, launched in April 1962.[109] This production included radio and television coverage from the Goonhilly tracking station, outside broadcasts of the launch from the Cape, and interviews with Harrie Massey, the scientist in charge of the mission, and Lord Hailsham, the Minister for Science whose department had funded the mission, as well as being complemented by in-depth feature programmes.[110]

A May 1962 programme on the history and future of television, besides again profiling for audiences the potentially advantageous implications of the British development of satellite broadcasting, noted that the summer of that year was going to be a critical time. The programme drew on the links forged between Goldie's satellite television-minded Television Talks and Current Affairs department and the Institute of Electrical Engineers (IEE) regarding exploring the application of transmissions technology advances to broadcasting.[111] Goldie's division and the IEE had collaborated to demonstrate the first transmission of colour television between Paris and London the previous year. With *Ariel* in orbit, gauging the scientific opinions of the IEE at its annual conference, the programme's producer PB Stone felt confident enough to stress in the show that broadcasting was in a "state of flux both technical and political".[112] Political flux, here, as we have seen, referred to the implications of the imminent Pilkington Inquiry that presented criticisms of British broadcasting, including science programming, but which largely ended by reinforcing the status of the BBC and science broadcasters. Technical flux referred to the potential implications for broadcasters of the launch of the Telstar satellite. Telstar promised to realise and demonstrate the potential of practical satellite broadcasting that had long been recognised. However, national and organisational broadcasting policy ambivalence combined with inhibiting complexity and prohibitive cost-effectiveness meant that the optimism of British broadcasters waned, and that they would play a marginal consumer role in the satellite era.

[109] Ariel 1, also known as *UK-1* and *S-55*, was the first British satellite, and the first in the Ariel programme. Its launch made the United Kingdom the third country to operate a satellite, after the Soviet Union and the USA. It was constructed and launched in the United States by NASA and stayed in orbit for fourteen years.

[110] *BBC WAC* File R28/309/1: Wilson to various 22 Feb 1962.

[111] *BBC WAC* File T32/1184/6: Miall to McCloy 30 Jan 1962.

[112] *BBC WAC* File T32/1184/6: Stone to Goldie 7 May 1962.

Practical yet impractical: The impact of Telstar on British satellite broadcasting

On 10 July 1962, the US civil communications satellite Telstar 1 was launched into orbit. Telstar was both the world's first commercial and multinational satellite and the first satellite to be capable of relaying, rather than reflecting or transmitting, pre-recorded data. Telstar was designed to develop experimental satellite communications over the Atlantic Ocean, with the General Post Office (GPO) coordinating the British infrastructure, especially at Goonhilly, and the BBC heavily involved in creating and defining standards and conversion equipment. Yet, British broadcasting policymakers were largely unprepared for the influence of the Telstar experiment. The Pilkington Report of June 1962 barely considered the potential impacts of satellites on British broadcasting.[113]

Within the BBC, those individuals and divisions that had sought to encourage and explore the potential implications of satellite technology for broadcasting following Sputnik were certainly aware of the Telstar experiment. More than half a year before its launch, Douglas Stuart, a News team foreign correspondent stationed in America, had been tasked with researching the logistics of Telstar. Stuart's report revealed an unprecedented opportunity for broadcasters to demonstrate the application of satellite technology to broadcasting. However, Stuart's report also noted that the main aim of Telstar was to experiment with the possibilities of multiple telephone circuits. Stuart, thus, urged his British executive and production colleagues to exploit the devotion of a limited proportion of Telstar's relay time to a transatlantic television experiment.[114] The aim was to encourage national effort to be directed towards placing Britain at the forefront of the satellite broadcasting industry. BBC engineers placed their expertise at the disposal of technicians at the Goonhilly receiving station to ensure that the appropriate infrastructure was in place to facilitate regular satellite broadcasts.[115] The GPO, ITA and BBC formed a joint satellite committee to coordinate the British contribution to the historic programme *Across Europe by Live Television* to be broadcast in Europe and the US on 23 July 1962 and anchored by Richard Dimbleby.[116]

However, the capacity for BBC delegates to extract maximum value from the experimental programme was impacted by the caution of their partners' representatives on the joint committee. For example, Peter Bale in the Bristol office was frustrated that the Post Office only regarded the upcoming experiment as a technical exercise, rather than

[113] BBC (2011), *op. cit*. Only the Hunt and Peacock Committees of the 1980s considered satellite (and cable) policy explicitly.

[114] *BBC WAC* File T32/1184/5: Stuart to various 15 Dec 1961.

[115] *BBC WAC* File R34/1118: Rooney Pelletier to Singer 26 Feb 1962.

[116] *BBC WAC* File T10/16/1: joint press release 26 Apr 1962, Minutes 5 June 1962.

appreciating its significance as a world news story both as a "political weapon and a scientific achievement" in advancing the cause of satellite broadcasting, as well as in the Cold War. Bale was convinced that "enthusiasts may be willing to stay up all night to catch the first pictures" of the programme and that this popular enthusiasm should be capitalised upon to gather support for their satellite broadcasting ambitions.[117] Peter Dimmock, experienced General Manager of BBC Outside Broadcasts and Features whose team, under Singer, would largely facilitate the European contribution to the programme, warned his ATV counterpart Bill Ward, that lack of ambition, such as whether to attempt colour television with the Telstar experiment, could "prejudice" the British presence in a global broadcasting future.[118]

Supplementary domestic and 'terrestrial' programming rhetorically reinforced the impact of the transatlantic satellite television experiment itself. In these supplementary programmes, satellite-minded producers sought to encourage expansive policies among British broadcasting organisations and politicians, so as to prevent the superpowers dominating the satellite broadcasting marketplace. One programme, thus, included a discussion between Dr Burt from the Royal Aircraft Establishment (Farnborough) and the science correspondent of the *Manchester Guardian* John Maddox, whose scientific sympathies often meant that he practised more in the mould of what I defined as a "scientific journalist" in chapter three. This discussion criticised governmental space policy indifference, emphasised the expertise of British engineers and scientists in space science, and advocated for the development of a European satellite system.[119] Another programme not broadcast via space also sought to suggest that this period was critical in influencing the future shape of satellite broadcasting. On 26 July 1962 *Telstar calling: Story of the first communications satellite* hailed "the brilliant first exchange of live television". This current affairs talk invoked Britain's communications heritage, especially in cables to the Empire and Commonwealth, in a call to arms to British broadcasters and policymakers not to allow the US to become "the pioneer and ourselves a junior partner" in global satellite broadcasting.[120] Being a supplier rather than consumer, as with ground-relayed programmes, depended on control of the infrastructure. British broadcasters hoped to emulate the capability of the US and USSR in launching satellites, and, thus, of being able to both create and supply the news.

The joint satellite committee placed considerable importance on national reaction to both the transatlantic experiment and supplementary programmes. Most delegates considered

[117] *BBC WAC* File T38/19: Bale to Rooney Pelletier 6 Feb 1962.

[118] *BBC WAC* File T10/16/2: Dimmock to Ward 19 Jul 1962.

[119] *BBC WAC* File T38/18: TV programme overview and shape July 1962.

[120] *BBC WAC* SFC: SC: 26 Jul 1962.

that the feedback and publicity they had received was "worldwide and excellent".[121] The bid to take advantage of Telstar to demonstrate the viability and desirability of satellite broadcasting had succeeded by their standards. The science journalist Anthony Michaelis spoke for many of his contemporaries when, in reporting on Telstar, he predicted that worldwide television was less than a decade away.[122] However, it was unclear what role British broadcasters would play in this era of worldwide television, especially as Michaelis also noted that competition for audiences would only get fiercer. It was the commercial aspects of satellite broadcasting that were both the most appealing and most challenging for broadcasters. For the BBC, as a publicly funded and directed institution, satellite broadcasting offered the tantalising potential of vast programming audiences and revenue, but the costs of constructing an infrastructure to be able to tap this potential were prohibitive.

Representatives of both the ITA and the BBC continued to be optimistic about the potential for British broadcasters to be suppliers of satellite broadcasting. Their hope was that further experimental satellite broadcasts and supplementary programmatic advocacy would pressure British space scientists and policymakers into developing a cost-effective satellite infrastructure that British broadcasters could use to claim a central place in a new broadcasting era. However, GPO technicians were concerned that broadcasters' "emphasis on communications demonstrations", in the name of ambition and prestige, was at the expense of rigorously testing such satellite systems. Consequently, it was resolved that "only items of international news interest", such as Wally Schirra's *Mercury 8* flight in October 1962, should be broadcast live via satellites such as Telstar in the interim.[123] Satellite advocates such as Singer, Controller of Programme Planning Joanna Spicer, and Controller of Programming on Television Stuart Hood, hoped that the popular enthusiasm that greeted such occasional items would demonstrate to broadcasting decision makers that a proactive satellite policy was required if the BBC was to be able to extract value from a global broadcasting marketplace by covering major space age events on their own terms.[124]

The demise of Telstar at the hands of the US atmospheric nuclear test Starfish Prime in December 1962 limited the opportunities of British broadcasters to broadcast via space. It was for this reason that satellite-minded BBC representatives welcomed the launch of Telstar 2 in May 1963, and hoped they would be able to come to an agreement with AT&T regarding purchasing satellite coverage of Gordon Cooper's orbital flight. The same year, Donald Baverstock, Assistant Controller of Programmes on Television, suggested a

[121] *BBC WAC* File T38/19: Minutes 27 Jul 1962

[122] *The Guardian* 25 Sept 1962, *op. cit*.

[123] *BBC WAC* File T38/19: Minutes 27 Jul 1962; File T38/22: Spicer to Hood 5 Nov 1962.

[124] *BBC WAC* File T38/22: Spicer to Hood 5 Nov 1962.

programme about and using Telstar 2, in conjunction with the American Columbia Broadcasting System (CBS) network. Baverstock wrote to Lovell in the hope he would take part in "linking up speakers in Britain, Russia and America" to discuss the implications of space technology on the broadcasting industry and society.[125] However, BBC executives were concerned that the use of these more advanced facilities still cost several thousand pounds for only a few minutes of transmission, even if shared among EBU members. BBC planners added that transmission and administrative arrangements for satellite broadcasts remained "exceedingly complicated" on the whole.[126]

Broadcasting producers and executives remained diverse in their attitudes and, thus, incoherent in terms of organisational policy towards satellite broadcasting. Paul Fox, Head of Public Affairs Programming on Television, argued to the Television Planning Controllers that EBU transmissions remained unreliable and hazardous rather than improving and that their administration had become "more involved and difficult" rather than simpler.[127] Satellite broadcasting was technically more complex and more expensive. Others remained convinced of the importance of satellite broadcasting to the future competitiveness and effectiveness of the BBC. Goldie visited America to view the latest progress in satellite technology as applied to broadcasting and found her views affirmed as to the "importance of using Telstar (2)" and other space relays.[128] Jay, again, pushed his worldwide television idea as the communications satellites were "progressively linking up the world's great television networks" in Europe, America, Asia.[129]

Telstar heralded the satellite broadcasting age with BBC programmes reinforcing the potential that overseas rivals would surpass British broadcasters as pioneers in the industry. Raymond Baxter introduced a 1963 *Challenge* programme with models of Telstar, for instance. Producers also noted Britain's commitment to scientific rather than communications satellites. Wilson interviewed Harrie Massey for a programme in the *Science Review* series celebrating the launch of Britain's second satellite (*Ariel 2*) in April 1964, for example.[130] There was a vicious circle that prevented British broadcasters from gaining a central place in a global satellite broadcasting marketplace. Slow developments in space technology and communications infrastructure meant that satellite broadcasts were not cost-effective. This lack of cost-effectiveness prevented policymakers and broadcasting executives from committing to active policies that would have fostered technical progress and improved the cost-effectiveness of satellite broadcasting. The BBC

[125] *JRUL SC JBA* File CS3/19/2: Baverstock to Lovell 26 Aug 1963.

[126] *BBC WAC* File T38/17: BBC memo to AT&T 8 May 1963.

[127] *BBC WAC* File T32/1184/7: Fox note 2 July 1963.

[128] *BBC WAC* File T32/1184/7: Johnstone to Goldie 17 June 1963.

[129] *BBC WAC* File T32/1184/8: Jay memo 22 Jul 1964.

[130] *BBC WAC* SFC: ESRO: 2 Apr 1964.

as a publicly funded institution could not afford to buy into the satellite broadcasting marketplace as a supplier, even in partnership with national or European allies keen to challenge the US dominance. Above all a European or British broadcasting satellite was needed, but one was not forthcoming. Planning Manager Spicer noted that it was expected from 1965 that there would be a US commercial satellite facility in place that would be effective in creating a global broadcasting audience.[131] The BBC and other British broadcasting organisations would become consumers, as US space activities and broadcasting institutions both created and supplied the news programming that would demonstrate the true potential of satellite broadcasting.

The US sews the system up: The BBC as a reluctant satellite broadcasting consumer

The optimism of British broadcasters about the future of satellite broadcasting was waning as British corporations struggled to maintain a presence in the global competition for audiences. Satellite-minded producers and managers could not overcome executives' principal concern with the cost-effectiveness of space communications technology. In April 1965, Spicer's predicted commercial facility came into existence in the form of the US *Intelsat I* (nicknamed *Early Bird*). *Early Bird* was placed in a geosynchronous orbit and was able to provide near-continuous telephone and television transmissions capability between Europe and America, as highlighted by the early May programme *Out of this World*. It became clear for broadcasting policymakers that it would be easier, cheaper and more effective for organisations such as the BBC to purchase satellite coverage of events such as the *Apollo* programme from dominant US suppliers than to seek to provide coverage of the events to viewers by investing heavily in satellite infrastructure.

However, becoming consumers of satellite programming did not solve all the cost-effectiveness problems of British broadcasters. Rather than investing in the long term in becoming a supplier, purchasing satellite broadcasts was a short-term solution. However, it was not a cheap solution, even when costs were shared among the EBU. The more dramatic *Gemini* programme captured the imagination of broadcast audiences. For *Gemini 4* in June 1965, BBC producers and executives were keen to provide their viewers with live coverage, but were shocked at the high price demanded for broadcast programmes transmitted via *Early Bird*. The cost-effectiveness concerns of executives meant that the

[131] *BBC WAC* File T10/16/2: Spicer to Dimmock 15 June 1964.

ITA and BBC were not even free to act as a consumer of satellite broadcasting.[132] For example, with *Gemini 7* in December 1965, Douglas Boyd, Senior Assistant in the BBC ESS told Neville Clarke at the EBU of his concerns over "the heavy costs involved in live peak-time relay", especially with colour satellite feed, for the newsworthiness and quality of end product.[133] The following spring, Michael Peacock, the Controller of BBC-1, and William Cave, Chief Assistant to Singer, discussed *Tomorrow's World*'s coverage of *Gemini 8*. Cave explained that NASA would cover the flight live, and that the satellite feed would be available to Europe, but that his team did not "expect the flight to be particularly exciting" and, thus, recommended that the BBC not seek to broadcast it unless there was enough interest among European audiences when costs could be shared.[134]

The American dominance of the satellite market, and the slow progress in technical quality, meant that broadcasting organisations, as consumers, were only willing to pay for satellite broadcasts of key events. In the summer of 1966 Boyd reported to his *Tomorrow's World* colleagues that only major sporting and space-race news coverage was still being offered to, and accepted by, representatives at the EBU.[135] Producers, especially in OBFS, were keen to circumvent executives' satellite cost-effectiveness concerns and still provide programming on the major events that would attract audiences through other avenues. Michael Barnes suggested to Cave that *Gemini 11* and *12*, and even *Apollo 1*, were unlikely to justify satellite facilities because the variety of the picture was likely to be limited. However, Barnes added that if there was good film of space events, even if of lower quality and drama, they should instead try to "obtain it quickly and cheaply from other sources", such as via cable or ground-relay.[136] For events and news that producers were sure would produce competitive programming that would attract mass audiences, BBC producers worked with broadcasting partners to improve the cost-effectiveness of satellite coverage. For the first launch of the Saturn 5 rocket in the winter of 1967 with *Apollo 4*, C Shaw, Planning Manager, and David Attenborough, Controller of BBC-2, had initially feared that the BBC would have to bear "heavy costs" because they could have been the only people interested in taking the transmission.[137]

The *Apollo* programme was an exception because of the intense audience interest in the moon landings. Here, as the BBC's Aerospace Correspondent Reg Turnill remembers, complexity and costs were largely irrelevant because of the popular 'effectiveness' of broadcasting programmes including live material from the spaceflights via satellites.

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[132] Swallow (1966), *op. cit.*, pp. 218-221.

[133] *BBC WAC* File T58/563/1: Boyd to Clarke 8 Dec 1965.

[134] *BBC WAC* File T14/2950/3: Cave to Peacock 4 Mar 1966.

[135] *BBC WAC* File T14/2950/3: Eurovision Newsletter 13 June 1966.

[136] *BBC WAC* File T14/2950/3: Barnes to Cave 2 Aug 1966.

[137] *BBC WAC* File T58/563/1: Shaw to Attenborough 3 Nov 1967, Bemberon to Spicer 10 Nov 1967.

Global broadcasting organisations were eager to purchase and receive the first colour transmissions from space with *Apollo 10*, for example.[138] Similarly, a report on the proposed coverage of *Apollo 11* via EBU reveals that there was still competition and collaboration for the more expensive allocated transmission and relay time among the international pool of networks.[139] However, Planning Manager Shaw was concerned the BBC would "not be able to provide the staff for more than a small part of the technical requirements" for their planned spring and summer 1969 programmes on *Apollos 10* and *11* as either a consumer of satellite broadcasts or customer of satellite facilities.[140]

The July 1969 live moon landing pictures provided both a dramatic climax to the space race and a symbolic reminder of the potential of space communications. The BBC skimmed pictures of the astronauts' television transmissions from the costly satellite links to be used as an element within their own terrestrial broadcasting. British broadcasters now occupied a place as a customer rather than a provider in the global broadcasting era, relegated to broadcasting occasional moments of pageantry to their audiences. A *Panorama* special, titled 'The British Space Programme', marking the historic events, revealed a sense of lost opportunity and optimism among broadcasters and broadcasting organisations who had assumed the notion of a world served by universal live BBC television. In engaging Val Cleaver, of the BIS and Rolls Royce rocket division, and Geoffrey Pardoe, a consultant engineer for Hawker Siddeley's Space Division, as contributors, the producers knew that there would be a critique of the inhibition of British satellite policy. The programme's discussants argued that while European governments had been "making up their minds", the Americans, building on British pioneering, had already got the world satellite broadcasting system and market sewn up.[141] Post-*Apollo*, the cost-effectiveness of satellite broadcasting remained prohibitive for the BBC as a public service broadcaster, with even space events less newsworthy and less likely to attract audiences. Yet, the BBC would become a prominent satellite organisation when broadcasting direct to the home was developed in the 1980s.

Conclusion

The opening of the space age coincided with a ratings crisis for the BBC. The BBC was forced to adapt to preserve its status and audience share. However, adaptation was not

[138] Turnill (2003), *op. cit.*, pp. 149-156, 198-200, 202.

[139] *BBC WAC* File T58/607/1 Apollo 11: EBU project report.

[140] *BBC WAC* File T58/565/1: Note by Shaw 31 Mar 1969.

[141] *BBC WAC* File T58/410/1: 'British Space Programme – 24 hours'.

easy for a publicly funded institution. The launch of Sputnik was believed by many British broadcasters to be the crucial first step towards the development of satellite broadcasting. Many satellite-minded broadcasters in the BBC expected that international contenders would soon join their national television rival in the competition for mass audiences. Space science played a crucial role in the efforts of BBC producers and managers to compete in what they expected to become an increasingly commercial and populist industry as a public service broadcaster. Developments in space science offered a seemingly endless supply of material with which to form programmes that would entertain and inform audiences. Linked to this aspect, the specific development of satellite communications offered the potential for British broadcasters to cover and supply this material, including major events such as the space race, on their own terms and to new global audiences. Only the first avenue would be of significant benefit to the BBC.

From astronomy to astronautics, space science offered a plentiful supply of dramatic, scientific and political material for broadcasters hoping to attract a significant proportion of the interested audience. Science talks, documentaries, news and magazines became key tools in the BBC's ratings war. As a result of their expertise in producing such output in an increasingly populist culture, science broadcasters and broadcast science journalists saw their production identities and authority elevated. Even political approaches from scientific community lobbyists to regain some measure of production agency only served to reinforce the professional status and autonomy of science broadcasters. Tom Burns defined such expertise as synonymous with the "amateur", one who is finished in a particular skill. In this instance, the particular skill in question was broadcasting science in a British industry many of whose members were preoccupied with the expectation of increased competition for audiences, rather than adhering to a public service mandate.[142] However, the eagerness of producers and executives for science programming caused problems, especially in terms of policy. The internal competition fostered to meet external rivalries produced destructive interdivisional tensions over responsibility for housing the BBC's science-mediating expertise. The same culture and development of science broadcasters and broadcast science journalists as specialist industry resources also meant that they were subject to the fickleness of a culture responding to audience demands. When the popular interest with science waned the value of science-sympathetic specialist producers and journalists decreased. Science programming remained an important, but niche, broadcasting resource.

More than competing with broadcasting rivals in terms of content, the development of satellite broadcasting offered the potential to create, reach and supply new audiences with content such as science programming, and, especially, the most dramatic space age

[142] T Burns (1970): 173.

events. Numerous British broadcasters explored the potential revolutionary implications for broadcasting production and distribution of space communications on the assumption that its industry rivals would be similarly motivated. If the BBC was to partake in the seemingly inevitable competition for global audiences on its own terms, it would need to develop its own satellite infrastructure. It quickly became clear that the infrastructure required to provide effective broadcasts via space was beyond the financial resources of a public-service institution. Political support was not forthcoming to change this situation, despite the encouragement of satellite-minded producers and executives. British broadcasters became suppliers of satellite broadcasts to their audiences purchased from commercial organisations dominating the infrastructure and market, especially in the US. The cost-effectiveness of satellite broadcasting remained so inhibiting that the BBC struggled even to act as a purchaser of satellite broadcasts for all but the most major events, like the moon landings. Satellite broadcasting had offered the BBC the potential to outmanoeuvre its commercial rivals, but the cost-effectiveness concerns of the industry prevented all but the most commercial organisations from further eroding the audience share of public service institutions.

Space science had been invested in as a crucial tool for broadcasters to seek potentially to exploit on two fronts. By the end of the 1960s, though, its usefulness had waned. In the aftermath we see that space technology had changed the mechanics of the production arena for all of broadcasting, not just science broadcasting, by revolutionising transmissions techniques in the medium. In the common science broadcasting production arena, the increased emphasis on entertainment in broadcasting culture meant that science broadcasters and broadcast science producers had to further foreground their media expertise in attracting audiences. In doing so, they cemented their crucial science-mediating identity in the arena and reinforced the authority of media culture over the arena. Science and scientists were largely marginal to the arena and its negotiations. This marginalisation only became a 'problem' of science in the broadcast media when popular ambivalence spread to broadcasting and science broadcasters and broadcast science journalists were marginalised from being a frontline broadcasting resource. It was this latter fact that especially caused friction with scientists. For example, the space scientist Desmond King-Hele found that media specialists were increasingly preoccupied with news rather than science in working with the BBC on their coverage of *Skylab*.[143] In the next chapter, a case study of the promotional activities of Bernard Lovell and the supporters of the Jodrell Bank telescope project, we will see how the changes in the mechanics and negotiations of the science writing and science broadcasting production arenas affected scientists' approaches and attitudes towards mass media popular science. In particular, I will highlight the fluidity of the common production arenas to show that the 'problem' of

[143] J Meadows (2000): 198-201.

science in the media only emerges when claims to production arena cultural authority are asserted *and* the social authority of science is questioned.

Chapter Six

Constructing an iconic narrative: Aligned and divergent interests at the Jodrell Bank-media interface

In chapter two, I revealed how the British Interplanetary Society (BIS) came to fear engaging with the media even though they understood that it could be a useful tool in their advocacy at the science-media-public interface. The BIS Council developed this fear because media professionals and executives extended their cultural authority over the production of popular scientific representations. As seen in previous chapters, the motivation for extending the production authority of media culture lay in the fact that popular scientific material constructed by writers and broadcasters could provide a valuable resource in media competition for mass audiences. For scientists and BIS Fellows, these developments in the common production arena constituted a problem, in that they could no longer directly popularise or influence the mediated popular representations of their activities presented to mass lay audiences. The supporters of the Jodrell Bank radio astronomy observatory telescope sought to manipulate this shared production forum to promote the project. Over twenty years from 1948, Jodrell Bank and media actors found themselves in frequent production negotiations with regard to the narrative surrounding the high profile telescope project.

Bernard Lovell, the Director of Jodrell Bank, and university and governmental partners involved in the project did not fear the media in the same way as the Council of the BIS. This was because journalists, editors and broadcasters viewed the spectacular telescope as being of significant news value. Because of this news value, and his own developing fame as *the* public scientist of his day, Lovell, in particular, enjoyed a considerable production influence over popular representations of the project. This influence was at odds with the general trend in the common arena of the increasing authority of media culture. Lovell appreciated that his anomalous production influence in engaging with the media could be of significant advantage to Jodrell Bank. In production interactions media professionals largely undermined their own identities and expertise by allowing Lovell relatively direct access to mass audiences. Media professionals were, thus, largely complicit in constructing a narrative of scientific modernity around the telescope such that it was approved, sustained and secured.

The reason why media professionals were complicit in facilitating the popularisation of Lovell was that they too could benefit from emphasising this iconic narrative in terms of copy and programming that would appeal to mass audiences. It was only in the period in

which the telescope project encountered serious financial and political difficulties that these aligned benefits and interests between Jodrell Bank and media actors diverged. When interests diverged regarding popular representations that exposed the problems of Jodrell Bank, the production arena became much more a forum for tense and contested negotiations. During the project's difficulties, Lovell and his allies sought to avoid engaging with the media altogether or, at the least, employ media management techniques that would provide some measure of influence over the news agenda. On the other side of the arena, journalists and editors in particular asserted their authority over production, and resented and resisted the application of PR methods that sought to undermine their professional identities and mediating expertise.

These production negotiations concerning popular representations of the telescope project show how science and the media seek to exploit each other. The interactions at the Jodrell Bank-media interface also show that the common production arena is mostly fluid and uncontested and of mutual benefit. However, the 'problem' of science in the media, as constructed by the scientific community, was being exacerbated by developments within media culture, especially the politicisation of public affairs for entertainment. These developments meant it became easier, on occasion, for the media to exploit science without advantage in return. Now, not only was the social authority of science threatened by the inability of scientists to directly popularise but also journalists and broadcasters could actively challenge this social authority. For most of its existence, and especially following the tracking of Sputnik's carrier rocket, though, Jodrell Bank was secure within an iconic narrative that was not publicly disputed and was reinforced by the interpretations of media professionals. Similarly to the foundation of the BIS, the origins of the telescope project were rooted in enrolling and exploiting the media to promote its legitimacy and consolidate its supporters.

'Selling' the telescope project as a spectacle: Lovell's pragmatic approach to mass media promotion

Following the end of the Second World War, astronomer Bernard Lovell began the construction of a radio astronomy observatory as a division of the University of Manchester physics department headed by cosmic ray researcher Patrick Blackett. Comprised mostly of recycled wartime radar equipment, the station enjoyed some notable early success in confirming the cometary origins of meteors. In 1948, Lovell conceived of the idea of building a large paraboloid, or telescope, in order to extend the observatory's sensitivity capabilities and reinforce Jodrell Bank's position at the forefront of a fledgling field with

the promise of new discoveries. The University supported this plan, particularly Bursar RA Rainford, Vice-Chancellors Sir John Stopford and Sir William Mansfield Cooper, and the Chair of the Council, the industrialist Lord Ernest Simon. Such a telescope was very much 'big science' and required extensive financial resources, and, especially, the support of the government. Blackett enlisted the backing of the Department of Scientific and Industrial Research (DSIR), under its Secretary Sir Ben Lockspeiser, but the backing of the Treasury was needed for the project to be feasible.[1]

To obtain the necessary Treasury support, Lovell and the backers of the telescope sought to construct a narrative around the project to 'sell' the idea. In his cultural study of Jodrell Bank, Jon Agar notes that the project's partners sought to construct particular representations of the telescope such that it would gain popular, and, most importantly, political approval. Lovell, the University and the DSIR Press Office variously sought to exploit the malleability of interpretation of the proposed telescope to appropriate and fashion the radio astronomy dish as a 'spectacle' of science. Its supporters argued that the telescope would be a prestigious showpiece of national achievement and optimistic ambition as Britain sought to assert itself on the postwar world stage.[2] Mark Edmonds echoes this analysis, arguing that the project was characteristic of and exemplified the zeitgeist mentality of monumentality and supermodernity. Edmonds suggests that the telescope was necessarily conceived of as a device capable of capturing both the secrets of the universe and the imagination of the public.[3] However, fashioning such narratives and representations of scientific modernity around the project was difficult because of the intangibility of the telescope in the proposal stage.

To help make the telescope proposals more tangible and the narrative have more impact on the public and politicians, Charles Husband, of Sheffield consulting engineers Husband & Co., was commissioned to draft designs for the formidable technical project. The lack of physical material and progress with regard to the proposed telescope did not preclude media interest in Lovell and Jodrell Bank. Having a newsworthy scientific project meant that media professionals deferred much production authority to Lovell in particular and allowed him to directly address mass lay audiences. This media interest and Lovell's production influence offered a means for the selected narrative to be propagated widely. This was especially true of the burgeoning broadcasting medium in which Lovell quickly

[1] Lovell has 'officially' documented the history of the Jodrell Bank experimental station. See: B Lovell (1968), (1973), and (1985).

[2] J Agar (1998): esp. 225-235.

[3] M Edmonds (2010): 775, 779, 782-783, 794.

became a celebrity-scientist and synonymous with the telescope project through frequent appearances on the radio and television in the late 1940s and early 1950s.[4]
As discussed in chapter four, space science programming was a valuable resource for both the BBC and science producers because it offered the opportunity to entertain audiences while adhering to a public service mandate. As a spectacular and prestigious example of postwar science ambition, then, material on Jodrell Bank and its proposed project was much sought-after by broadcasters. Lovell was motivated by a social relations of science philosophy, and his talent for undertaking extensive popular exposition, which producers believed would reproduce and translate well in the more nuanced techniques of broadcasting, reinforced this demand.[5] BBC Radio science producer Archie Clow, for example, after absorbing a lecture delivered by Lovell to the British Association on the discovery of meteoric origins, recognised the potential value of a talk or feature on radio astronomy, including as a potential experiment in television science given the subject's visual aspects.[6] Despite this opportunity to promote the narrative surrounding the project and, thus, encourage the acceptance by the Treasury of the telescope's proposals, Lovell rejected the request by Clow to deliver a broadcast talk on the subject. In this rejection, Lovell was not being conservative with regard to promotion, like the BIS Council; rather, he was being pragmatic.

Lovell and the project's backers did not fear engaging with the media but, as the proposals had become mired in bureaucracy, they had little physical material with which to work to construct the narrative they wanted for the telescope and secure its approval. In the late 1940s and early 1950s Lovell and University and DSIR representatives employed a similar promotional strategy to that of Cleator in the early years of the BIS that rhetorically appealed for support and legitimacy. Lovell, for example, exploited his local ally AP Wadsworth, editor of the *Manchester Guardian*, to contribute largely unmediated short articles to the columns of this newspaper regarding the project's progress and promise.[7] Lovell and the DSIR publicists also made sure that Jodrell Bank and the telescope plans were associated with events that echoed the narrative they wished to construct. The showcase of scientific modernity that was the Dome of Discovery at the 1951 Festival of Britain was one such event. The Festival directors responsible for science, among them Penrose Angwin, and BBC science producers Arthur Garratt and Ian Cox, sought to present

[4] Lovell could be described as what Rae Goodell called a 'visible scientist': an authoritative and disproportionately high profile and talented expositor. He could also be described as what Hans Peters called a 'public expert': one who was actively involved in the construction of a social reality by means of public communication because media professionals consider them as enriching their stories and programmes. See: R Goodell (1977) and HP Peters (2008).

[5] *BBC WAC* File BL 1: Lovell to Maconachie 13 May 1939.

[6] *BBC WAC* File BL 1: Clow to Lovell 14 Oct 1947, Lovell to Clow 19 Oct 1947.

[7] *JRUL SC MGA* File GDN/149: Lovell to Wadsworth 6 Nov 1950, Wadsworth to Lovell 14 Dec 1951 and 11 Feb 1952, Lovell to Wadsworth 18 Dec 1951; ECBS: B/L296/1: Lovell to Wadsworth 29 Nov 1949.

"notable British contributions to the balance of civilisation". Angwin and his staff contacted Lovell for advice on the topic of "radio and radar astronomy" viewing the field as a pioneering discipline and a potential focus for the Dome.[8] Working with Garratt, who helped coordinate the celebratory and nationalistic coverage of the Festival by the Third Programme, Lovell constructed the section on radio astronomy such that it was centred on a dramatic working radar system to bounce echoes back from the moon and a paraboloid to record meteor echoes. Angwin enthusiastically endorsed these ideas that, he believed, reflected "great credit" on British science.[9]

This pragmatic promotional strategy, facilitated by media allies, was sufficient to construct a narrative that directly appealed for popular support and gathered the political backing required to convince the Treasury to consider the telescope's proposals seriously as potential flagship of British science. Lovell sought actively to exploit his substantial broadcasting production influence to reinforce this narrative and secure final authorisation for the telescope to begin construction. Despite the editorial concerns of producer Felicia Elwell regarding the programmes' intelligibility, Lovell wrote scripts for, and delivered, three talks in a Third Programme *Science Survey* series focusing on the technical minutiae of the prospective 'Mark I' telescope.[10] In another instance Lovell contributed a sequence on the scientific promise of radio astronomy and Jodrell Bank to a film by John Read of the Talks Department as part of a series built "around eminent British personalities".[11] For broadcasters, such collaborations, and no small measure of professional deference, meant they were able to produce output that was both topical and cultural. For the project's backers, their celebratory and nationalistic narrative was reinforced, improving the chances of the Treasury giving the telescope the go-ahead.

In the spring of 1952, the telescope was finally authorised by the Treasury. Once the physical foundations were laid Jodrell Bank and the project became the subject of more intense media attention. Publishers, journalists and broadcasters frequently sought out Lovell as a knowledgeable, articulate and, mostly, accessible source who was connected to a prestigious institution.[12] In addition, he could supply material with which to satisfy the interests of their audiences in the telescope. Clow, for example, re-established contact with Lovell regarding the production of a *Science Survey* feature programme around the groundbreaking.[13] Despite the fact that the construction was in its earliest stages and there was far from any scientific data to discuss, the prestige and profile of the telescope

[8] *JRUL SC JBA* File CS3/30/4: Angwin to Lovell 21 Apr 1949.

[9] *JRUL SC JBA* File CS3/30/4: Angwin to Lovell 8 Feb 1950, Lovell to Garratt 21 Nov 1950.

[10] *JRUL SC JBA* File CS7/13/5: Elwell to Lovell 30 Jan 1951 and 9 Feb 1951.

[11] *BBC WAC* File CS7/13/5: Read to Lovell 13 Mar 1952.

[12] P Conrad (1999): 300-301.

[13] *BBC WAC* File BL 1: Clow to Lovell 23 Apr 1952.

project was such that Lovell was again deferred to in terms of production authority. This was the case, now, even with the press, with Lovell invited to contribute largely unmediated articles to various newspapers. In May 1952, WH Kennett, editor at *The Times*, was delighted that Lovell was prepared to write a special article for their 'Science Review' section. Kennett was content to allow Lovell full discretion in the construction of the article because space was "not a matter of the first importance" in such supplements and in terms of science journalism expertise among the newspaper's staff. Lovell was happy for Kennett to lightly edit the article so as to "focus attention on the magnificent project", and, thus, to further reinforce the narrative surrounding the telescope.[14]

However, despite Lovell's level of production oversight, the intense media interest in the project meant that it was increasingly difficult to control and direct the popular narrative regarding the telescope. Journalists and broadcasters were keen to continue to promote Jodrell Bank as a beacon of British science. Lovell and the project's backers had the same goal, but wanted to instigate and oversee all such popular representations of the telescope. This was not a wariness of the potential damage of engaging with the media such as had inhibited the promotion of the BIS Council. Rather, Lovell and the University and DSIR publicists preferred to construct and present the public with the popular narrative concerning the telescope directly, and on their own terms. This desire for full control over the project narrative manifested itself in a circumspect and responsive promotional strategy, especially with the telescope remaining in the early constructional stages. For a time, the deference to and dependence of media professionals on Lovell for material that could attract mass audiences allowed him the authority to be selective in terms of those offers that would provide him with unmediated access to audiences. R McCarthy, Northern Editor of the *News Chronicle*, for example, reluctantly offered Lovell full editorial oversight of a potential series of stories on the project, even to the extent of vetoing the idea if desired.[15]

However, at some point, journalists and editors in particular, even Lovell's press allies, became frustrated with the influence that Lovell had over the production of popular images and messages regarding the telescope project. Press proprietors and writers, like McCarthy, were keen to benefit from carrying what they believed would be distinctive and newsworthy copy about Lovell and Jodrell Bank that would allow them to compete for mass media audiences.[16] The interests of telescope backers and media actors had become slightly misaligned, even though both sides wanted to promote the project. Sensing this shift in their relationship with print media professionals, and the growing challenge to their management of the project narrative, Lovell and the telescope's promoters

[14] *JRUL SC JBA* File CS7/41/1: Kennett to Lovell 8 May 1952, Kennett to Lovell 17 Oct 1952.

[15] *JRUL SC JBA* File CS7/41/1: McCarthy to Lovell 16 Oct 1952.

[16] *Ibid*.

eschewed engaging with the media for a time. Their hope was that in avoiding contact with journalists in particular, and, thus, by constraining access to information, mediated representations concerning Jodrell Bank would be minimised.

Just as the BIS frequently resorted to media outlets and channels in which they retained more direct access to audiences, so Lovell and his fellow publicists also sought to circumvent the mediating authority of writers and broadcasters. The aim of Lovell and his allies was to continue to reinforce the narrative to consolidate the progress and status of the telescope, but on their own terms. Publishers in the burgeoning popular science book market still offered scientific experts a significant production influence and a means to directly popularise to lay audiences.[17] Jodrell Bank researchers published numerous texts designed for the lay reader, with Lovell himself publishing *Radio Astronomy* in 1952. Such a pragmatic promotional approach, in which Lovell dictated the terms of engagement with the media, continued to serve the telescope project well. Similarly, science writers such as John Hillaby, a freelance contributor to the *Manchester Guardian* and *New York Times*, deferred much production influence to Lovell, partly because of their partisanship to science, but also to ensure they secured access to material that would enable them to demonstrate to editors and publishers their expertise in presenting print media popular science that would attract readers.[18]

By 1953, Lovell and his fellow publicists had largely managed to exploit the media as a mere conduit to construct a narrative surrounding the project that positioned the telescope as a crucial component of Britain's 'new Elizabethan age'. This narrative had, eventually, secured the authorisation of the project and its early history as a beacon of scientific modernity, not to mention Lovell's celebrity status. Media professionals had been complicit in constructing the status of the telescope by facilitating the popularisation of the project's backers, allowing Lovell an unusual production influence. Journalists and broadcasters allowed Lovell to enjoy this production influence because it was also in their interests to seek copy and programming stressing the positive narrative to attract mass media audiences. However, editors and journalists, in particular, were tiring of the project's publicists' production influence, and, especially, their demands to address audiences unmediated and have full control over popular representations of the telescope.

Such lingering tensions between media professionals and Jodrell Bank backers surfaced in confrontation once political and financial problems emerged publicly within the first couple of years of construction. Lovell and his allies sought to implement a 'containing' PR strategy that they hoped would steer the production agenda of the media towards selected and acceptable popular representations. In this way, they hoped to protect the

[17] J Turney (2008): 5-8.

[18] *JRUL SC JBA* File CS7/41/1: Hillaby to Lovell 16 Jul 1952.

narrative and, thus, status of the telescope. Journalists, editors and proprietors, on the other hand, felt that such a media management strategy undermined their professional expertise and identity as public trustees. Now, the interests of media professionals had diverged from those of the stakeholders in Jodrell Bank as they could benefit from publicising both the spectacle and the problems of the telescope. Negotiating and contesting authority over the production of popular representations of the project was crucial to the narrative surrounding the telescope and, thus, its completion.

Protecting the project in crisis: Tensions flare in the Jodrell Bank-media relationship

Even in the early years of the telescope's construction it was clear that the project was not going to be as trouble-free as its backers hoped. Lovell and his allies encountered several major issues as the telescope was being built. First, there were problems with local citizens as researchers attempted to define a zone of scientific 'quiet' around Jodrell Bank. This desired isolated zone clashed with plans for the spread of new towns, the expansion of the electricity 'grid', and the electrification of railways in the observatory's vicinity.[19] The most pressing problem, however, was the spiralling cost of the telescope. The cost increases were partly due to rising material prices and partly because of formal design changes, the latter delaying construction and creating tension between astronomers and engineers over responsibility for the telescope. It quickly became clear that the project was going to be seriously over-budget. The problem was compounded by the early 1950s nationwide financial crisis that meant that the University and DSIR were unable to contribute extra funds. These partners and Lovell appealed to the Treasury for an increase in funding but were rejected until the telescope's worth could be demonstrated. It was also becoming clear, though, that the anticipated completion date of 1955 was unrealistic, and so this worth could not be demonstrated. The outcome of these difficulties was several embarrassing Public Accounts Committee (PAC) inquiries that threatened the completion of the project.

Soon, popular and political interest in the problems of the project was as intense as it had been in the telescope itself. To appeal to this mass interest, media professionals sought material on both the virtues and deficiencies of Jodrell Bank. Editors and journalists, in particular, could benefit from supplying copy on both the highlights and difficulties of the project. Lovell and the telescope's backers, above all, wanted to avoid a focus on the

[19] Agar, *op. cit.*, p. 223.

negatives to preserve the public narrative that had surrounded the project. But sustaining this narrative was now crucial to the continuation of the telescope's construction, and so some effort had to be made towards encouraging a popular and media focus on the project's positive aspects. Lovell understood that his selective promotional approach was no longer viable. Press writers and proprietors no longer allowed him full editorial oversight and vetoing authority. Popular representations of the telescope would now appear whether the project's publicists instigated or wanted them to or not.

With this change in production negotiations, alongside DSIR Information Officers Col. Walter Hingston and Norman Manners, and successive University Vice-Chancellors and Bursar Stopford, Mansfield Cooper and Rainford respectively, Lovell implemented a new promotional strategy. This new strategy sought to ensure that the popular representations of the telescope that would inevitably appear in the media would reinforce, rather than undermine, the project's narrative. The approach involved releasing more positive information and restricting access to potentially damaging information about Jodrell Bank to the media. This was a defensive approach designed to mould favourable popular images of the telescope project in the mass media, and one that is still employed by scientific institutions today.[20] Yet, this approach was also active, in that Lovell and his allies were hoping to implement what Martin Bauer and Jane Gregory identify as the postwar shift in science communication from a logic of journalism towards a logic of corporate communication. This logic hoped to instigate a source-driven reportage of science and skew the news agenda positively in favour of the project.[21]

This new promotional strategy was a form of protective public relations (PR). With problems mounting for the project, Lovell and his fellow publicists viewed their PR as what Borchelt calls 'managing the trust portfolio'.[22] Their aim was to constrain the popular images and messages of the telescope so as to minimise criticism and, thus, be able to convince the project's stakeholders, especially in the Treasury, to allow the telescope to be completed. The Jodrell Bank publicity machine was part of broader developments in an increasingly consumerist postwar society in which both public and private enterprise wanted to put across particular views to citizens and the media.[23] 'Big science' was no exception to this, given the extensive financial resources it required. The science writer JG Crowther, who suggested that science had become extensively "penetrated with the techniques of advertisement and public relations", noted this trend. Crowther argued that such techniques were powerful tools in the most organised hands, with the best exponents

[20] D Nelkin (1987): 131, 154, 167-169.

[21] MW Bauer and J Gregory (2007): 33-34.

[22] RE Borchelt (2008): 147-150.

[23] J L'Etang (2004): 56, 90.

able to influence the agenda of the media.[24] Lovell and his fellow publicists proved adept at employing manipulative PR.

Of the two aspects of the new promotional strategy, Lovell favoured minimising the potential for negative headlines, even at the expense of potential positive exposure. Lovell's focus, then, was on restricting access to information about the project, and he believed the best way to ensure this restriction was to avoid engaging with the media, especially in situations that could question the legitimacy of Jodrell Bank. It was for this reason that Lovell rejected Clow's offer to appear on a broadcast programme on flying saucers, arguing that he was regarded as "being in a state of madness by a considerable number of people" because of the project.[25] His avoidance strategy was based on his faith in what science communication scholars call source dependence.[26] Lovell hoped that if he could restrict the access of media professionals to those involved with the project, especially himself, then fewer potentially adverse popular representations could result. Lovell's celebrity status was now both useful and dangerous. To help restrict access to Jodrell Bank actors, Lovell sought to rhetorically construct the notion of the observatory as a purely scientific workplace, as well as simultaneously as a cultural icon, that was being disturbed by the popular interest in their progress and problems.[27]

In favouring the restrictive aspect of the new promotional strategy, Lovell remembers that he was in opposition to other members of the publicity machine. Hingston, a former press journalist, did not believe that such a restrictive strategy was viable given the intense media interest in the high profile project that Lovell had helped to create. Hingston also believed that seeking to restrict access to a publicly funded science project could be viewed as a diversionary tactic, and could actually invite increased scrutiny of the telescope's problems.[28] Lovell was in strategic opposition to his DSIR and University allies when it came to formulating and implementing the promotional strategy regarding the project during its difficulties. Hingston and Rainford, on behalf of the University, were of the mindset that as some media focus on the telescope's problems was unavoidable, they should actively try to overwhelm this focus with popular representations that sought to emphasise the narrative of spectacular scientific modernity. Their belief was that all publicity could be good publicity if they actively engaged with the media and sought to influence the production of popular images and messages about the telescope in these engagements.[29] Subsequently, Hingston and Rainford occupied a more central role in

[24] JG Crowther (1970): 329.

[25] *JRUL SC JBA* File CS7/13/5: Lovell to Clow 15 May 1953.

[26] D Nelkin (1987): 144, 153.

[27] B Lovell (1968): 178-184.

[28] *Ibid*.

[29] Agar, *op. cit.*, pp. 107-115.

handling media inquiries with the hope of gaining further widespread support for the project.

However, Lovell was the figurehead of Jodrell Bank and the telescope, and it was Lovell whom writers and broadcasters wanted to engage with. Consequently, Lovell retained a controlling hand in the promotional strategy for the project. The public was, thus, excluded from any access to the observatory. As a compromise, media engagement was limited to those opportunities that offered the telescope's publicists the best prospect of influencing the production and news agendas.[30] Lovell, the University and the DSIR pressured media allies and jointly arranged press conferences and media days, and employed press releases, that offered selected information about the project. It was hoped that such methods would ensure that writers and broadcasters focused on the positive aspects of the telescope and that the interpretation of media professionals in constructing popular representations regarding Jodrell Bank would be in such a way that the narrative was reinforced. However, such a strategy was not foolproof. For example, the first attempt at a press release marking the project's authorisation in April 1952 was inadvertently leaked. In addition, the narrative that Lovell and the project's backers hoped to reinforce did not match the reality for the journalists and broadcasters finally allowed access to the observatory and its workers. Media professionals often left disappointed by the lack of material progress.[31] Some of these PR efforts actually undermined the narrative of progress surrounding the telescope that Lovell and his allies had worked hard to construct.

The attempts of the Jodrell Bank publicists to manage and manipulate the media into promoting the telescope was severely tested by the intensifying popular interest in the flagship project's deepening problems. In November 1953, Baron Frederick Erroll, Conservative MP for Altrincham and Sale and later Minister for Trade, publicly questioned the priority given to the telescope over the extension of satellite towns in the neighbourhood. Erroll argued that his constituents did not gain any benefits from conceding to the demands of those involved with Jodrell Bank.[32] Erroll was playing the political publicity game that Lovell and his allies had played so well, seeking to manipulate the conclusions of the imminent first PAC Report into the telescope project's overspending to his advantage. Lovell was angry at the press coverage, especially in an influential and partisan local newspaper, but moved quickly to undermine Erroll's manoeuvre and secure a less critical PAC outcome.

[30] *JRUL SC JBA* File CS1/5/8: Lovell to Rainford 26 May 1954 and 28 Feb 1955; File CS7/39/5: Memo 18 June 1957.

[31] Lovell (1968), *op. cit.*, p. 70.

[32] For example, see: *The Manchester Guardian* 11 Nov 1953, p. 12.

Lovell sought to exploit his influential metropolitan media ally AP Wadsworth, editor of the *Manchester Guardian*, to instigate a widespread countermove in the press that stressed the project's positive narrative. Lovell provided Wadsworth with selected exclusive details of the dispute that he hoped would form the basis of, and frame, the *Guardian*'s commentary on the matter following Parliamentary questions.[33] Through this connection, Hingston was also able to work with the *Guardian*'s sympathetic science correspondent, Trevor Williams, to publish an article stressing the telescope's benefits to science and the nation's standing just days before the first PAC inquiry into the overspending in late 1953.[34] Lovell also sought to utilise his radio contacts, including RJ Boston of the North Region Talks Department in Manchester, to offer a counterargument.[35] In the end, Erroll's political manoeuvre had little impact on the status of the telescope project.

A major part of the reason why there was little impact from this incident was that Lovell and his publicity allies were able to marshal counter-coverage that preserved the telescope's prestigious narrative. However, Lovell took exception to the interpretations of some of their media allies in this counter-coverage, even though they had been largely and deferentially sympathetic. Wadsworth had dispatched a *Guardian* reporter to Jodrell Bank so that Lovell could express the points he wished to make clearly. Following publication, Lovell complained that the article did not emphasise the national importance as much as he had stressed in conversation with the reporter. Wadsworth was apologetic but did not believe that Lovell had cause to complain. However, he suggested to Lovell that "there must be far more to it than appears on the surface".[36] In this final exchange, Wadsworth implicitly admitted that media professionals remained dependent on scientific sources. However, Wadsworth was also expressing the growing resentment among writers and broadcasters at Lovell's and scientists' demands for production oversight.

As problems mounted for the telescope project, these tensions in the Jodrell Bank-media relationship surfaced. Editors and journalists, in particular, resented attempts by Jodrell Bank publicists to manage the media interest and undermine their professional identities and expertise by setting the news agenda through PR strategies.[37] These were limits surfacing in media professionals' dependence on, and deference to, scientific experts.[38] Even partisan science writers could not always be relied upon to allow Lovell production influence because, as we saw in chapter three, they now had to foreground their media

[33] *JRUL SC JBA* File CS7/41/1: Lovell to Wadsworth 16 Nov 1953.

[34] Lovell (1968), *op. cit.*, p. 180.

[35] *JRUL SC JBA* File CS7/13/5: Boston to Lovell 26 Nov 1953.

[36] *JRUL SC JBA* File CS7/41/1: Lovell to Wadsworth 11 Nov 1953, Wadsworth to Lovell 15 Nov 1953.

[37] W Göpfert (2007): 215-216, 224-225.

[38] A Hansen and R Dickinson (1992): 375. P Conrad (1999): 290-294.

expertise and authority in order to consolidate their social identity in the production arena. Lovell did receive a warning from Trevor Williams' successor at the *Guardian*, John Maddox, of a potentially damaging expenditure article in the *Sunday Times*.[39] However, science writers were now just as likely to be critical as sympathetic. Chapman Pincher, the *Daily Express* science and defence correspondent, well known as an investigative journalist, uncovered and revealed the 'secret' military applications of the radio communications work at Jodrell Bank. It was these secret military applications that had partly contributed to the design changes and, thus, rising costs of the telescope project.[40]

Ultimately, these changes and tensions in the relationships between the telescope's publicists and media professionals were manifested in a challenge to Lovell's production influence. Because popular representations of the project were now instigated, mediated and interpreted by media professionals this was a potential threat to Lovell's control over the narrative regarding the telescope. With the financial and political worries of the project deepening, Lovell would find it increasingly difficult to represent the telescope both as a spectacle of scientific modernity and apolitically. From around 1954 and 1955 was the first real period in which Jodrell Bank promoters encountered what many scientists had constructed as the 'problem' of science in the media. This challenge to Lovell's ability to directly address mass audiences meant that as much, if not more, popular focus was targeted upon the telescope's problems as its virtues. This focus on the project's problems, the telescope's partners felt, could potentially jeopardise its completion by influencing the attitudes and recommendations of the PAC. Lovell, in particular, believed that avoiding negative coverage was critical to the future of the project. As Lovell admitted to chief project engineer Charles Husband, he felt that press journalists were the source of most of the telescope's unwelcome coverage and "offensive" actions with regard to gaining access to information about Jodrell Bank.[41] Consequently, Lovell sought to avoid engaging with the press as much as possible.

The project's promoters, instead, concentrated their efforts to consolidate the narrative surrounding the telescope in those media channels in which Lovell still enjoyed relatively unmediated access to mass audiences compared to the press. As with BIS Fellows, Lovell found that broadcasters still afforded scientific experts much production influence.[42] Producer RJ Boston, whom Lovell had worked with previously, for example, though writing the programme script himself now, reassured Lovell that he was "absolutely free to

[39] Lovell (1968), *op. cit.*, p. 180.

[40] B Lovell (2008).

[41] *JRUL SC JBA* File CS7/41/2: Husband to Lovell 19 Jan 1956.

[42] Similarly to Lovell, the space scientist Edward Appleton enjoyed a production influence over science broadcasters that extended to him being able to persuade BBC radio science producer Archie Clow not to schedule a programme on a similar subject at the same time as his 1956 Reith lectures for fear it would "steal his thunder". See: *BBC WAC* File EVA 1c: Appleton to Clow 21 Mar 1956, Clow to Appleton 21 Mar 1957.

suggest whatever alterations" he wished, especially in regard to technical claims.[43] Producers, as with film consultants, continued to defer this production influence because radio astronomy and Lovell offered valuable broadcasting material and rare talent in broadcasting technique.[44] Grahame Miller, also of the North Region Talks department, noted this situation when writing to Clow that Lovell was regarded "as an admirable broadcaster with great gifts for popular exposition and as an expert on a subject which undoubtedly has great interest for lay listeners".[45] As a result, broadcasting media representations of the project were much more positive and less critical than in the print media. Broadcasters, thus, were complicit in and crucial to Lovell's efforts to reinforce the telescope's stature at a time when its future was in question. A summer 1955 talk by Lovell on *The Invisible Universe*, with a heavy focus on developments at Jodrell Bank, was syndicated worldwide over the BBC network, for example.[46]

This promotional approach was an effective embargo on the press, a medium that Lovell, in particular, was increasingly ambivalent towards because editors and journalists no longer deferred to scientific experts in production. This avoidance strategy further irritated editors and journalists frustrated at the well-rehearsed attempts of Lovell and his fellow publicists to employ media management techniques that sought to set the news agenda.[47] This tension was manifested in a legitimate eagerness of press proprietors and writers to uncover exclusive material on Jodrell Bank for use in their competition for newspaper readers.[48] With both sides seeking control over access to and interpretation of information about the telescope project, there was a latent possibility of confrontation. This latency was released when the press was barred from media coverage of a visit to Jodrell Bank arranged as part of the September 1956 annual BA meeting. Lovell and his University and DSIR partners had decided not to invite press representatives because they did not want to risk the potential of representations of the project focusing on their problems with another PAC Report imminent. However, this strategy backfired, as a *Times* correspondent gained unauthorised access to the visit and an article appeared suggesting further design changes in the telescope had led to the level of overspending rising further.[49]

In this instance, Lovell was unable to call upon media allies such as Wadsworth to overwhelm this example with counter-coverage that reinforced the project's narrative of national scientific importance. Lovell wrote to the editor of the *Times*, Sir William Haley,

[43] *JRUL SC JBA* File CS3/19/1: Boston to Lovell 12 Jan 1955.

[44] DA Kirby (2008a): 41-45.

[45] *BBC WAC* File BL 1: Miller to Clow 3 Jan 1957.

[46] *JRUL SC JBA* File CS7/10/5: Franzén to Lovell 17 Aug 1955.

[47] Nelkin, *op. cit.*, pp. 111-114, 128-131, 144, 153, 155-159.

[48] P Wright and N Morrison (1997).

[49] *The Times* 3 Sept 1956, p. 5, col. F.

formerly with the *Manchester Evening News* and *Guardian* and recently Director-General of the BBC, to demand an explanation and apology for the actions of the journalist in obtaining unauthorised access to Jodrell Bank and for the alleged "misleading information about the telescope" in the subsequent article. Lovell's grievance was dismissively passed down to the Deputy News Editor FC Roberts, who asserted the freedom and mediating identity and expertise of the press and journalists. Roberts stressed to Lovell that their correspondent was "acting in fulfillment (sic) of his prime duty", which was to seek news wherever it was to be found. Roberts also noted that the *Times* had not received any note of protest over bias from any other source including the DSIR. Finally, Roberts argued that imposing an embargo only on the press was unacceptable and "unfair to the profession of journalism".[50]

In this final statement, Roberts was making it plainly clear to Lovell that production authority lay within media culture and that efforts to undermine this authority by scientific culture would be challenged. Such tensions over which culture ought to be responsible for creating popular scientific representations still resonate today.[51] Lovell, it seems, sensed that stoking tensions with editors and journalists could result in more negative headlines and articles that focused on the project's problems in the future. In response to Roberts, then, Lovell somewhat conceded the point that the PR strategy of the telescope's publicists had been unfair. He appreciated that the press had been "generally somewhat disturbed" with the conditions imposed upon them with regard to being excluded from covering and reporting on the visit. Lovell also sought to remind Roberts that those at Jodrell Bank had always accommodated the *Times*' correspondent's previously, even affording them "special privileges" on occasion. Thus, Lovell sought to ease the conflict with potential media allies who could significantly influence support for and the future of the telescope. However, Lovell concluded his exchange with Roberts by arguing that it was not one of the project's publicists "duties to invite the press" every time they arranged a private party of visitors to the observatory.[52] This final correspondence indicates that Lovell was not going to relinquish his production influence without protest, and that he was still planning to seek to limit access to and interpretation of information about the telescope project.

Unable to negate the influence of the press, Lovell now viewed engaging with the entire mass media as inherently of danger to the narrative of scientific modernity they had constructed around the project and sought to promote, and best avoided. That did not mean there were no options available to the Jodrell Bank backers for reinforcing this

[50] *JRUL SC JBA* File CS6/2/1: Lovell to Haley 5 Sept 1956, Roberts to Lovell 6 Sept 1956, Lovell to Roberts 10 Sept 1956.

[51] Nelkin (1987), *op. cit.*, pp. 159-169.

[52] *Op. cit.*, fn 50.

narrative and countering criticisms of the telescope. Lovell was a member of the Science Research Council and the British National Committee on Space Research organised through the Royal Society. On these boards, Lovell emphasised the importance of the telescope to British space science. Lord Simon was Chair of the University Council and an unwavering supporter of the project. Simon worked with Lovell to ensure that he could emphasise the concept of the Jodrell Bank telescope as a symbol of British prowess in House of Lords debates.[53] Both these approaches, it was hoped, would sway political favour in support of the project. In addition to courting political favour, Lovell and Stopford, in correspondence with Secretary of the Royal Society, DC Martin, attempted to bring further pressure to bear on the Treasury and the PAC to encourage the swift completion of the telescope by coinciding the opening of the telescope with national ceremonies to mark the beginning of the IGY. However, this plan to reinforce the project's association with the forefront of space science was thwarted by further delays in construction.[54] This association was reinforced, though, in the 1957 propagandist documentary film *The Inquisitive Giant*, produced by the DSIR in collaboration with the Foreign Office and Central Office of Information.

Lovell also sought to popularly promote the narrative of scientific modernity surrounding the telescope through media channels and outlets in which it remained possible for scientific experts to have their messages facilitated rather than mediated. The burgeoning popular science magazine market was one such channel. Editors of fledgling magazines such as *New Scientist* were keen for celebrity-scientists, such as Lovell, in high profile fields, such as radio astronomy, to contribute to their periodicals in order to help appeal to new constituencies and secure their financial stability.[55] Lovell was able to exploit this demand from sympathetic science writers such as Nigel Calder and Tom Margerison to secure the production influence required to write numerous articles detailing the telescope project's progress, ambition, and potential as a showpiece of British scientific achievement.[56] Popular books also remained a valuable outlet, with publishers amenable to providing Jodrell Bank researchers with extensive editorial oversight. However, one opportunity to promote the telescope was rejected because the author, WL Rae, was a member of the BIS as well as the Royal Astronomical Society, and, therefore, it was assumed could potentially associate the project narrative with the fantastical rather than the forefront of science.[57] Broadcasters also remained more deferential to both science and scientists because they were essential components of programming and producers did not want to strain relations, as seen in chapters four and five.

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[53] *JRUL SC JBA* File CS6/2/1: Simon to Lovell 24 Sept 1956; File CS6/2/2: Simon to Lovell 13 May 1957.

[54] *JRUL SC JBA* File CS7/39/5: Lovell to Stopford 23 Oct 1956.

[55] Agar, *op. cit*, p. 22.

[56] *JRUL SC JBA* File CS2/5/1: Margerison to Lovell 18 Oct 1956.

[57] *JRUL SC JBA* File CS2/5/2: Rae to Lovell 15 May 1957.

Given the intensity of media interest in the telescope project, avoiding engaging with the media did not preclude popular images and messages from appearing. In fact, this strategy made representations that undermined the positive narrative more likely because it stoked tensions with media professionals and because Jodrell Bank publicists played no part in their construction. In refusing to engage with writers, especially, Lovell and his allies were unable to prevent external parties appropriating the project for their own interests, on occasion to seek to attract mass newspaper audiences with what they felt was misrepresentative material. Lovell, for example, was concerned by a "garbled reference" to the project in a manufacturer's advertisement in *The Times* that they were powerless to prevent.[58] Such garbled references undermined plans made by Lovell, Stopford and Cooper to restrict information about the telescope from early 1957 until its completion, slated for later the same year.[59] After this resolution, Lovell spent an increasing amount of his time seeking to prevent all popular representations of the telescope. Lovell recruited allies such as Blackett to help him mitigate the potential impact of unwelcome publicity on the telescope's future. On one occasion, Blackett was able to persuade the editor of the *Sunday Pictorial* not to publish an article questioning why Jodrell Bank was resisting pressure to offer access to the observatory. Following this incident, Lovell admitted to Blackett that he was expending most of his effort on mitigating the substantial "wastage of time and annoyance" the media caused to Jodrell Bank rather than concentrating on the telescope's completion.[60]

In the summer of 1957, Lovell and the project's supporters heard that the PAC Report of later the same year that had the potential to decide the fate of the project was expected to be critical. Lovell also expected that these criticisms would be of significant interest to the media. With this knowledge, Lovell and his fellow telescope publicists were forced to change to a promotional strategy that actively engaged with media professionals, despite the potential risks. Their aim was to overshadow the criticisms of the Report with widespread popular and media representations of the telescope that depicted the project in such a way that it would be perceived as too valuable to cancel. Lovell and his allies hoped that such rhetoric would motivate politicians, and especially the Treasury, to provide the support and resources to push the telescope through to completion, despite its endemic problems. Lovell collaborated with producers Philip Daly and Aubrey Singer on the BBC's International Geophysical Year (IGY) production, *The Restless Sphere*. In the process, Lovell was able to exploit the popular enthusiasm with the IGY and influence the emphasis of the programme such that the Jodrell Bank project was portrayed as a flagship of Britain's contribution, even though the telescope was not quite operational.[61]

[58] *JRUL SC JBA* File CS7/39/5: Lovell to Stopford 29 Sept 1956.

[59] *JRUL SC JBA* File CS7/39/5: Lovell to Cooper 26 Feb 1957.

[60] *JRUL SC JBA* File CS7/41/3: Lovell to Blackett 26 Jan 1957.

[61] *JRUL SC JBA* File CS3/19/1: Lovell memo 21 June 1957.

The campaign to emphasise the value of the telescope was invaluably assisted by the first collection of data. Lovell claims that, up to this point, only "the sheer momentum and massiveness of the project saved it from stoppage and disruption" and, indeed, from cancellation.[62] Lovell quickly supplied his partners in the University and DSIR Press Office with the information on the preliminary tests, suggesting that they should emphasise how the telescope "behaved perfectly and fulfilled all expectations" when engaging with the media.[63] The hope was to use this first tangible demonstration of the scientific prowess and purpose of the telescope to steer the news agenda towards stressing the narrative of national competitiveness. In the process, as Lovell admitted privately to his astronomical colleague JG Wilson, it was hoped that the "dreadful slashings" from the PAC would subside.[64] In the end, neither this promotional campaign nor the PAC Report decided the fate of the telescope.

Through this period of serious problems with the project, it was, I argue, the strength of the narrative of scientific modernity that had been constructed around the telescope that sustained it. Various media management strategies were attempted to protect the solidity of the narrative from unwelcome challenges. However, PR methods caused tensions with media professionals and it was actually when the telescope's promoters openly engaged with the media that the production arena was most fluid, and that media professionals were more likely to be complicit in reinforcing the narrative. It was not clear in the autumn of 1957, even with the telescope becoming operational, whether this narrative was solid enough to protect the project from another round of PAC criticisms. It was certainly not clear whether it was strong enough to encourage the Treasury to sanction the clearing of Jodrell Bank's debt. The launch of Sputnik allowed the project's supporters to demonstrate the telescope's value beyond doubt. It could not have come at a better time.

The serendipity of Sputnik: The media construction of the Jodrell Bank telescope as a space age icon

The Jodrell Bank telescope was in the final stages of construction and testing when the Soviets launched the Sputnik satellite in October 1957. Within a week the telescope was hastily pressed into action to track the carrier rocket and confirm the orbital status of Sputnik. The upper atmospheric physicist Edward Appleton described the tracking as the

[62] Lovell (1968), *op. cit.*, p. 136.

[63] *JRUL SC JBA* File CS7/41/3: Lovell to Jeanes 12 Aug 1957.

[64] *JRUL SC JBA* File CS6/2/2: Lovell to Wilson 16 Aug 1957.

"triumph" of the project.[65] More than its size, and more than its first collection of scientific data, it was the fact that the Jodrell Bank telescope was the only instrument in the Western world that could detect Sputnik's carrier rocket by radar, and, thus, could confirm that the Soviet satellite was actually in space, that ended questions over its value as a symbol of national ambition and achievement. As a British contribution to the dramatic and momentous opening of the space age, the popular interest in Jodrell Bank and Lovell also intensified.

Media writers and broadcasters knew that Lovell and the project's supporters needed and wanted to exploit this popular interest in the demonstration of the telescope's world-leading capabilities. As Jon Agar notes, they hoped, in particular, to try to further sway the imminent recommendations of the PAC with regard to their overspending and decisively secure the telescope's future.[66] Media professionals, in turn, sought to exploit these concerns to secure exclusive material and contributions from Jodrell Bank and Lovell. Mary Hewat of Granada, for example, appealed directly to the problems the project still faced. Hewat stressed to Lovell that "the only way to persuade the economist to provide money for necessary research is to get enough people interested". She added that agreeing to appear on her *Youth Wants to Know* programme would help in this cause, even at this busy time.[67] However, the telescope's promoters were cautious in their acceptance of such requests, and in their engagements with the media. This caution was based on the concern of Lovell and his allies that they could not prevent media professionals, and journalists in particular, interpreting the news in such a way that criticised the government for not supporting the project. The press frequently suggested that politicians were failing to capitalise on this occasion of historic national prestige by writing off the project's debt and allowing the telescope to reach its full potential.[68]

Lovell and the telescope's promoters knew that avoiding the media was not practical or even desirable. They devised a promotional strategy based on press releases that they hoped would manage the media interest and attention. For example, a publicity statement of 14 October by Lovell largely consisted of confirming the ability of the telescope to detect Sputnik by radar. By releasing such selected sterile information regarding the telescope, it was hoped that popular representations would be steered away from the political aspects of the project and towards celebrating the scientific achievements of Jodrell Bank. At the same time, such statements were designed to appeal directly to the PAC through the media but without the possibility of being construed by the government as a political ploy from the project's backers and adversely influencing the negotiations

[65] *JRUL SC JBA* File CS6/2/2: Appleton to Lovell 24 Oct 1957.

[66] Agar, *op. cit.*, pp. 108, 124.

[67] *JRUL SC JBA* File CS6/2/2: Hewat to Lovell 9 Oct 1957.

[68] Lovell (1968), *op. cit.*, p. 191.

with the Treasury. In the 14 October release, for example, Lovell added that the telescope had "demonstrated its potential in all the fields of activity for which it was intended when it was first conceived in 1948".[69] In another instance, Lovell supplied University Vice-Chancellor Mansfield Cooper with information emphasising the value for money aspects of the project for use in statements to the media.[70] These were clear attempts to emphasise the telescope's world-leading efficacy, even if it was overdue and over budget. Lovell and his publicity allies in the University and DSIR also hoped that such a strategy would allow them to limit the information released to the media "short of losing their good will".[71] Their hope was to a manoeuvre a significant production influence without attracting the ill-feeling of media writers and broadcasters for undermining their professional identities and expertise. In the same 14 October press release, this strategy of seeking to enlist the help of and exploit the media was revealed when Lovell acknowledged the help and understanding they had received from journalists and producers in the frantic post-Sputnik period.[72]

Yet, this press release strategy was not was not without its problems, especially in terms of influencing the news agenda. DSIR Secretary Harry Melville told Lovell of his concern over comments that appeared in the press that suggested the government had been treating Lovell like a "criminal" with regard to the telescope's overspending. Melville added that public statements of this kind, even if "errant" media misrepresentations, jeopardised their political negotiations to clear the debt.[73] Lovell was acutely concerned at the way in which the selected information released in media statements could still be 'twisted', especially by journalists. Hingston sympathised but told Lovell that there was no means of preventing the press manipulating the material "in whatever way they like" and according to their own agendas.[74] As Massimiano Bucchi suggests, when scientists seek to communicate publicly the mediating and interpreting function of the media and audiences means that the outcome of such efforts cannot be determined a priori.[75] It was the mediating identity and production authority of journalists, in particular, which meant that popular representations of the telescope criticised the government despite the attempts by Lovell to limit the publicly available information regarding the project and its issues. Press reporters did not defer to the attempts at influencing production, because discussing the political problems of the telescope could provide copy to attract mass readers as much as discussing its scientific capabilities. In providing evidence to the PAC, Lovell laid

[69] *JRUL SC JBA* File CS7/41/3: Statement 14 Oct 1957.

[70] *JRUL SC JBA* File CS7/39/5: Lovell to Cooper 20 Nov 1957, Cooper to Lovell 21 Nov 1957.

[71] *JRUL SC JBA* File CS7/41/3: Cooper to Lovell 23 Oct 1957.

[72] Statement 14 Oct 1957, *op. cit*.

[73] *JRUL SC JBA* File CS6/2/2: Melville to Lovell 29 Oct 1957, Lovell to Melville 1 Nov 1957.

[74] *JRUL SC JBA* File CS7/41/3: Hingston to Lovell 25 Nov 1957.

[75] M Bucchi (1996): 380-381, 386-388.

responsibility for any public criticisms of the government on this mediating function of journalists.

It was for diplomatic reasons, then, that around six weeks after the confirmation of Sputnik's orbital status, when media attention was somewhat subsiding, Lovell wrote to Cooper suggesting that Jodrell Bank publicists should seek to avoid engaging with the mass media, and especially the press, for the time being. He argued that this could be achieved at least until the delayed final constructional tasks had been completed, which were scheduled to be marked by an official opening of the telescope.[76] Lovell, instead, sought to promote a celebratory but apolitical narrative, exploiting his celebrity status through relatively unmediated channels. The telescope was displayed as a showpiece of national scientific prowess at the 1958 Brussels International Exhibition (World's Fair), alongside a showcase of broadcast media technology organised by BBC science broadcaster Andrew Miller Jones.[77] Lovell was also able to exploit the sympathies of science writers who identified closely with the expertise of scientific journalism described in chapter three. For example, Lovell was able to encourage Nigel Calder to emphasise the scientific achievements of the telescope in his popular magazine articles and books.[78]

In addition, the cultural profile and prestige of space science and radio astronomy meant that Jodrell Bank was considered as prized programming matter, and Lovell as a prized contributor, by broadcasters who remained prone to offering him production oversight. Lovell was invited to deliver the prestigious Reith lectures in 1958, in the third of which he incorporated a live experiment whereby a human voice was transmitted using the moon as a circuit.[79] In these lectures, Lovell sought a broader cultural significance for what astronomers did and focused on what it meant for Jodrell Bank to play a central and pioneering role in both cosmological and terrestrial space developments.[80] Later, Lovell also offered his assistance to BBC filmmaker Ian Dalrymple, who was producing a film "showing recent British enterprise and achievement". Lovell was able to focus much attention on the telescope as a symbol of British scientific competitiveness in the programme.[81] Eventually, though, science broadcasters were forced to withdraw their deference to scientific authority in order to be able to reinforce their professional identities as broadcasting specialists, as seen in chapter five with technological developments and changes in industry culture favouring the advance of media culture authority over the common production arena.

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[76] *JRUL SC JBA* File CS3/19/1: Lovell to Cooper 25 Nov 1957.

[77] *JRUL SC JBA* File CS2/5/1: Miller Jones to Lovell 2 Aug 1956.

[78] *JRUL SC JBA* File CS2/5/3: Calder to Lovell 15 Sept 1958.

[79] *BBC WAC* SFC: A&A: 9-30 Nov 1958.

[80] Edmonds, *op. cit.*, p. 789.

[81] *JRUL SC JBA* File CS7/41/4: Dalrymple to Lovell 22 Sept 1959.

In any case, Lovell's fellow project promoters did not believe that Lovell's promotional strategy was sufficient to secure the telescope's future. University and DSIR publicists felt that Lovell's avoidance of the mass media would cause unnecessary tension with writers and broadcasters, and journalists in particular, who were crucial to their goal of capitalising on the widespread support for Jodrell Bank to pressure the government to clear the project's debt. Cooper sympathised with Lovell's complaints that dealing with the media interest was preventing him and his researchers' pushing forward with exploring the scientific capabilities of the telescope. Yet, Cooper was also adamant that certain publics and supporters should be allowed access to Jodrell Bank, in order to continue to reinforce the narrative of scientific modernity.[82] Rainford, of the mind that the telescope seemed "certain to be 'in the news' fairly frequently", went one step further, suggesting that more formal arrangements for handling the popular interest be made beyond the ad hoc media assistance of Hingston, Manners, and LE Jeanes from the DSIR Press and Information Offices. With the encouragement of WL Francis of the DSIR, Rainford suggested that the University should provide adequate facilities such that criticisms of a lack of access to Jodrell Bank would be avoided.[83]

The protests of his allies were sufficient for Lovell to acknowledge the advantages of having cordial media relations. Lovell admitted to Melville that he was "full of apprehension" at the prospect of handling future popular interest. However, Lovell also conceded that it was "in the national interest to maintain the excellent relations (with the media) and flow of information" so as to build overwhelming popular and political support for the clearance of the project's debt.[84] In the autumn of 1958, then, as a consequence of these negotiations with fellow telescope supporters, Reginald G Lascelles, ex- President of Manchester University Student's Union and a ham radio enthusiast, was appointed as public relations officer for Jodrell Bank. Lascelles' responsibility was to liaise with and cater to the interests and needs of media professionals and obtain a production influence such that images of the Jodrell Bank telescope were depicted prominently, accurately, and favourably in the media and in the best interests of the project. These are the same reasons why scientists and scientific institutions employ PR methods and public relations officers (PROs) today.[85]

Despite his concessions to the arguments of his allies, Lovell had reservations with regard to this more proactive promotional strategy. Like the BIS Council, and partly because of intense political scrutiny of his culpability for the project overspending, Lovell remained more anxious to avoid publicity that could impact upon the negotiations to secure the

[82] *JRUL SC JBA* File CS7/39/5: Cooper to Lovell 24 Feb 1958.

[83] *JRUL SC JBA* File CS7/41/4: Francis to Rainford 12 Aug 1958.

[84] *JRUL SC JBA* File CS7/41/4: Lovell to Melville 15 Oct 1958.

[85] Nelkin, *op. cit.*, pp. 136-140.

telescope's future. He preferred that any popular representations of the Jodrell Bank project that occurred in the media only address the scientific value of the telescope. It was for this reason that Lovell regretted attempts by the DSIR to associate Jodrell Bank with external, inherently politicised space race events. In November 1958, it was widely publicised that the telescope would be employed as the means of confirming whether a US moon rocket attempt had succeeded. The probe misfired, and Lovell complained to DSIR Press Officer Norman Manners that such failures were "more difficult than success" to manage in terms of the popular and media interest, and that they could only reflect negatively upon the project's status.[86] Lovell was also careful not to align himself with any popular images and messages that could undermine the importance of astronomy, especially with policy and funding competition becoming increasingly fierce among the space science field. It was for this reason that he sought to distance himself from the DSIR's endorsement of astronautics, asserting that he did "not wish to be associated" with the stance taken, for fear of diminishing the significance of the telescope and radio astronomy in popular and politicians' minds.[87]

Lovell, like the BIS Council, remained especially concerned by his inability to directly address mass audiences and, thus, wary of what he perceived as the potential of the media to misrepresent scientific information and the twist the comments of experts.[88] For example, he was glad to learn that comments in the *Times* attributed to Dr Olin Eggen, of the Royal Observatory, regarding Jodrell Bank were "nothing more than the usual newspaper maltreatment of remarks".[89] As discussed earlier, blaming the media for irresponsible coverage is a standard expert defence mechanism among scientists and a means by which they seek to regain some measure of production influence.[90] Therefore, despite the commitment to active promotion he had made to the telescope's other supporters, Lovell became preoccupied with ensuring the popular representations of the project did not seek to allocate blame for the telescope's continuing debt. He formally reminded the research staff at Jodrell Bank that the University had strict rules regarding the publicisation of its activities. He added a stern warning that "disciplinary measures" would be taken if intentional breaches of this policy were made.[91] Lovell was of the mind that unauthorised releases of information had even more potential to invite media interpretations focusing on government meanness than officially sanctioned publicity.

[86] *JRUL SC JBA* File CS7/41/4: Manners to Lovell 13 Nov 1958.

[87] *JRUL SC JBA* File CS7/41/4: Lovell to Manners 25 Nov 1958 (original emphasis).

[88] C Condit (2004): 1415-1416.

[89] *JRUL SC JBA* File CS7/41/4: Lovell to Eggen 21 Sept 1959.

[90] Nelkin, *op. cit.*, preface.

[91] *JRUL SC JBA* File CS7/41/4: Internal notice from Lovell to Jodrell Bank staff.

Lovell's strategy of avoiding attracting the ire of politicians at the expense of gathering potential overwhelming popular and political support could not be justified because the government remained resolute in its refusal in negotiations to underwrite the project's debt. Worse still for the telescope's backers was that the policy of not seeking to capitalise on the post-Sputnik interest had meant that the narrative they had constructed had not been reinforced. This neglect meant, in turn, that popular support that was to bring pressure to bear on politicians and gather financial support from other sectors had somewhat waned. For example, the educationalist John Wolfenden noted in correspondence with Lovell that many among the lay public were unaware that the Jodrell Bank telescope was one of the world's most advanced scientific instruments.[92] Lovell's publicity partners in the University and DSIR pleaded with him to assist in their efforts to exploit prevailing political debates and actively promote the value of the project as an example of Britain's scientific and engineering competitiveness. Manners argued that "deeper consideration" should be given to certain media requests for access, especially to those media professionals who it was felt would be more sympathetic to their plight and more partisan to their cause.[93] Courting science journalists, for example, was viewed as potentially a means for the telescope's promoters to indirectly popularise the "most recent achievements in science".[94] Cooper implored Lovell and Lascelles to exploit the "national interest" in the project and, in the process, despite the disruption it would cause to the researchers, raise money by charging media writers and broadcasters for using the facilities at Jodrell Bank.[95]

These active promotional efforts strengthened the narrative of scientific modernity surrounding the telescope, and gathered overwhelming popular support for the clearance of the project's debt. Government approval, if forthcoming at all, was mired in bureaucracy and resentment at sporadic coverage that blamed ministers for the problems of Jodrell Bank. However, in 1960, the widespread support for Lovell and his fellow supporters encouraged Lord Nuffield, whose foundation had helped the DSIR share the initial costs of the telescope, to clear the project's arrears. Jodrell Bank and Lovell's futures and iconic statuses were now secured, and the observatory was able to become a relatively 'normal' scientific establishment. Despite their trials, Lovell and his fellow researchers looked to expansion and further telescope projects, and consolidating Jodrell Bank's position as a world-leading astronomical institution.[96]

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[92] *JRUL SC JBA* File CS7/9/1: Wolfenden to Lovell 19 Apr 1959.

[93] *JRUL SC JBA* File CS7/41/4: Manners to Lovell 27 Jan 1959.

[94] *JRUL SC JBA* File CS7/41/4: Rose to Lovell 25 Mar 1959.

[95] *JRUL SC JBA* File CS7/39/5: Cooper to Lovell 27 May 1959; File CS3/19/1: Lovell to Lascelles 6 Nov 1959.

[96] For more see: B Lovell (1985).

The association with Sputnik cemented the status that had been carefully nurtured of the telescope as an iconic symbol of national scientific achievement, as well as a British contribution to the space age. Thereafter, Lovell and his allies hoped to exploit this concept to build popular and political support such that the debt was cleared. Engaging with the media had the capacity to both facilitate and undermine this exploitation, depending on the interpretation of media professionals. Popular representations tended to emphasise both the iconicity of the telescope and the government's unwillingness to recognise this iconicity that the project's promoters had, ironically, worked so hard to construct.[97] It was very difficult for the project's supporters to influence enthusiastic media professionals only to stress the scientific and apolitical aspects of the telescope so as to promote the narrative, and only positively affect the ongoing political negotiations in favour of those invested in Jodrell Bank. In the end, the narrative was solid enough that popular support was sufficient to attract the resources required to secure the future of Jodrell Bank from sources other than the Treasury. This celebratory narrative continued to be promoted and facilitated by observatory and media actors to sustain the legacy of the Lovell telescope as an iconic instrument, even through the period of decreasing popular and political scientific interest and appreciation from the 1960s, most notably through the addition of a visitor centre in 1966, when the public were finally admitted access. As recently as 2008, there was public outcry when national policy indicated that the importance of Jodrell Bank was in question, even though the observatory had long since ceased to be at the forefront of space science.[98]

Conclusion

The history of Jodrell Bank, and in particular the Lovell telescope, is intimately connected to the iconic narrative that surrounds them. This narrative was constructed by the project's supporters to gain overwhelming support such that, at first, the telescope was authorised and, later, to sustain it through its difficulties and, eventually, to free Jodrell Bank from its problems. This support was gathered with the help of the media that Lovell and his allies sought to exploit to disseminate the selected narrative to mass audiences. On many occasions, media professionals deferred production oversight to Lovell. Writers and broadcasters did so because of what Steven Miller calls a "coincidence of tensions".[99] In the case of the Jodrell Bank-media interactions, it was also frequently in the interests of journalists and producers to emphasise the narrative of scientific modernity because

[97] Agar, *op. cit.*, p. 125.

[98] For example: *Manchester Evening News*, 7 March 2008, pp. 2, 9.

[99] S Miller (1994): 451.

this would resonate with, and, thus, appeal to, mass audiences. Such aligned interests echoes what Hans Peters labels the "congruent" or surprisingly strong co-orientation of scientific experts and journalists in many instances.[100] It was because of this congruency that the Jodrell Bank publicity machine did not fear the media in the same way as the BIS Council. In many ways, because Lovell was afforded more direct access to audiences than many scientific experts by media professionals he did not perceive the 'problem' of science in the media.

However, as both Miller and Peters also point out, even among the most cordial interactions at the science-media interface there is an essential and underlying tension. This tension, they argue, is a product of the different 'logics' of science and public communication, discrepant expectations, and, above all, because of differing agendas and concerns between the scientific and media actors. These tensions surfaced in the Jodrell Bank-media negotiations once the interests of the opposing actors diverged. The interests of those involved especially diverged once the telescope project encountered high profile financial problems. Conflict was identified in those periods in which the project's supporters and media professionals contested access to, and interpretation of, information that impinged upon the political negotiations regarding the telescope's future. Particularly contested was authority over the common production arena. No longer would journalists, especially, facilitate the popularisation of Lovell and his allies, or accept PR and media management techniques that sought to influence the news agenda by undermining their mediating identities and expertise.

In general, though, this case study of the promotional activities of Jodrell Bank highlights the fluidity of the common production arena, with neither scientific nor media cultures seeking or needing to assert their authority over the arena. Indeed, negotiations in the shared forum were largely amiable, as both sides collaborated in seeking the mutual benefits of exploiting each other. Only when one party could gain advantage at the other's expense – in this case, journalists' obtaining valuable copy on the political problems of the telescope project – did friction emerge and the fluidity become rigid. Though media culture had gained authority over the common production arena from the 1920s and 1930s, it was only in such instances, when the social authority of science was questioned, that media professionals' lack of deference of production influence to scientists over popular representations of their activities was constructed as the 'problem' of science in the media. In the thesis conclusion, I draw together the themes from this and the preceding chapters to argue for the virtues of the notion of a common production arena. I focus on the ability of such a concept to explain developments in negotiations at the science-media interface, and, especially, the analytical light it sheds on the origins of the 'problem' and

[100] HP Peters (2008): 136-140, 143.

the ‘boundary spanner’ science-mediating specialists. I suggest that these conclusions offer important insights into how and why popular scientific material in the mass media is produced today, a subject of critical importance to the notion of a scientific citizenry.

Chapter 7

Conclusion: Reflections on the common production arena

In late 2004, Beagle 2 publicist Colin Pillinger was invited to speak at a dinner of the Association of British Science Writers (ABSW). Pillinger told the assembled audience of science writers that he felt there was a "yawning gulf" between scientists and media professionals.[1] I argue that this polarisation, often echoed in the literature and discourse on science and the media and its problem, is an artificial dichotomy that prevents critical scrutiny of the science-media interface. I also suggest that Pillinger was being disingenuous, and contributing to the ideological labour of the rhetoric of the 'problem', because the efforts of the Beagle 2 publicity team discussed in the thesis introduction showed that episodes of science in the media need not be characterised by cultural tensions. In fact, the Beagle 2 campaign showed that the production of popular scientific representations is complex and not merely subject to the fact that media and scientific cultures clash over production authority. Rather, the efforts of Pillinger and his fellow mission promotional allies show that the production of mass media popular science is subject to much negotiation between scientific experts and media professionals and contingent on the availability and the mechanics of media technologies. The Beagle 2 publicity team were able to take advantage of the nature of channels such as the Internet, and the eagerness of media professionals and executives for material on the mission, to construct a relatively unmediated narrative surrounding the Mars lander project. This was at a time, 2003, when it was widely regretted among the scientific community that media culture held production authority, and that media professionals did not defer to scientific experts and allow them to directly address mass lay audiences. The most significant revelation from the Beagle 2 example is that popular scientific representations are considered of value by both media and scientific culture. It is for this reason that both cultures sought cultural authority over their production.

The shared space in which cultural authority over the production of popular scientific representations is contested I defined as a common arena. In this arena, then, popular scientific representations are a form of boundary object the production of which scientific and media cultures seek to absorb within the borders of their professional expertise. I argue that this conception is of certain value to unravelling the complexities at the science-media interface because it can aid understandings of how and why scientists, media professionals and executives, and science-mediating specialists, interacted, and

[1] *ABSW Archive*: Misc. *Science Reporter*: Oct/Nov 2004 p.6.

how factors such as technology impacted upon these interactions. In other words, a common arena can help explain how and why popular scientific representations were produced, and allow a unique critical and symmetrical examination of the historical development of science and the media. In addition, space science has the virtue of being value to all three actor groups and so can reveal the agendas and approaches at play in the negotiations for cultural authority over or social identity within the notional common production arena. I suggest that both production authority and the identities and expertise displayed by science-mediating specialists transferred from scientific culture to media culture across the middle part of the twentieth century, though this transfer was far from straightforward or always enforced. In the process, media culture was potentially able to gain much from popular scientific representations at the expense of science.

I argue that the main influence upon the common production arena and, thus, negotiations within the arena, was increased public demand for popular scientific material. Certain scientist-popularisers recognised and sought to satiate this demand, in order to preserve the tradition of experts in the specialist community generating and promoting selected popular representations of science. However, across the twentieth century, the most prevalent feature of the media was its economic and technological diversification in an intensifying competition for audiences. Distinctive popular scientific copy and programming was a niche industry resource for media professionals and executives. Because media executives and professionals largely controlled access to the platforms and channels, it was their conception of the production of popular science that triumphed from the contested negotiations. Now, a presence at the negotiating table, in the common production arena over which media culture held authority, was constrained to those members who demonstrated the ability to adapt to the techniques and demands of the media in that particular arena. Developments in media technology largely made the constraints of popular science production more nuanced and, thus, further favoured the advance of the authority of media culture over the arena.

These changes in the negotiations in the common production arena, and, thus, the science-media interface, are seen most readily in the relationship between science and the broadcasting media, especially in the BBC. The nature of broadcasting as a medium placed a significant emphasis on broadcasting technique. Compared to the print media, broadcasting presented producers and executives with significant challenges in attracting and retaining listeners and viewers. For those producers wishing to specialise in science programming, such as Mary Adams or supply broadcast science journalism, like David Wilson, the demands of broadcasting culture were paramount. Science broadcasters had to foreground their broadcasting expertise and commitment such that their programming would be of value in the schedules, especially once commercial radio and television competitors emerged for the BBC. Science broadcasters were able to demonstrate this

expertise, and exploit the virtues of scientific material that helped demonstrate a commitment to a public service mandate while seeking to attract audiences with exciting space science programming, to forge a new social and professional mediating identity in the arena. Scientific culture and scientific experts were largely marginal to these negotiations. Such was the authority of media culture over the arena, especially following the entertainment culture instilled in television, that the embedded scientific sympathies of science broadcasters eventually became a conflict of interest. Science broadcasters such as Aubrey Singer had to express publicly their acceptance of media culture over the arena. In addition, scientific developments that impacted upon media technologies, such as satellite communications, impacted upon the mechanics of the common production arena in that they revolutionised methods and techniques of production and transmission. However, these developments only served to reinforce the authority of media culture over the arena by intensifying competition for audiences and, thus, forcing members of the arena to further demonstrate their expertise in, and commitment to, the political economy of the media.

In the introduction, I hypothesised that the notion of a common production arena in which popular scientific material is a valuable and contested boundary object could aid symmetrical understandings of developments in the science-media interface by providing a space in which competing agendas and approaches of interacting scientific and media actors are played out. In the empirical chapters, I argued that lay public demand for popular scientific material and technological developments favoured and facilitated the extension of media authority over this arena. However, this extension was neither swift, nor without resistance from the scientific community. In addition, the production authority of media professionals and executives was not always asserted. In fact, as seen throughout the rich, long-view narrative history, the common production arena was highly fluid, and the subject of much negotiation. This fluidity immediately brings into question whether the arena could be meaningfully bounded and, indeed, its characterisations vary a great deal throughout the thesis, focusing on technical parameters in some instances and institutional factors elsewhere. These questions invite critical reflection on the theoretical model which seeks to describe developments in science-media relations and the production of mass media popular science, and whether the notion of a common production arena plays a meaningful role in constraining the course of events.

Evaluating the concepts of the arena and boundary objects reflexively, I would suggest that they useful but limited notions for studying science and the media. Kristian Nielsen puts forward a similar framework for analysing science-media partnerships in his study of the *Galathea* Deep Sea Expedition. Nielsen found a similar fluidity in the relationship between scientists and journalists in terms of negotiating how popular representations of

the expedition were produced in order to propagate a dominant scientific discourse.[2] However, I also appreciate how such a framework can unhelpfully constrain the argument and, in fact, detract from the richness of the case history. In particular, the dynamic, multivalent and complex developments at the science-media interface are hidden by simplistic terms that flow from seeking to adhere to the methodological model. For example, many instances of constructive negotiation and gameplaying between actors and actor groups are, instead, characterised by unnecessarily combative and binary descriptors, the same pitfalls that I identified in other scholarly analyses and set out to avoid. A better model, perhaps, to characterise the interactions and developments in the culture of production would have been to adapt Peter Galison's concept of "trading zones" as a contact or exchange sites across cultures and languages that are themselves in social, epistemological and technological flux. Extending this encounter notion, science-mediating specialists, versed in both science and the media, act as intercultural pidgins or creoles whose identities shift as the trading zones shift.[3] Although not endorsing the use of actor-network-theory for studying science and the media, I would urge future scholars undertaking similar studies to answer Ursula Plesner's plea to expose and analyse the contingent negotiations between actors and groups in production as insightful in their own right, and only at a much later stage to seek to construct generalising explanatory devices or frameworks to characterise developments at the interface.[4]

Despite reflecting on the limitations of the hypothetical common production arena notion, I contend that applying the concept analytically in my thesis revealed two significant supplementary arguments beyond characterising many instances and interactions at the science-media interface. Firstly, that the overall shift in cultural authority over the arena (or trading zone, or encounter, etc) was the source of the *historical* 'problem' of science in the media and, secondly, that the negotiations that led to this shift led to the emergence, and affected the development of, science-mediating specialists or 'boundary spanners'. Ultimately, the marginalisation of the identity and expertise of science-mediating specialists was, alongside popular ambivalence with science, the major catalyst for the 'problem' of science in the media to mobilise into a political movement designed to protect the social authority of science.

[2] KH Nielsen (2009): 473-477.

[3] P Galison (1997): 783.

[4] U Plesner (2010): 12-13.

The 'problem' of science and the media

In the early years of the twentieth century, science and scientists enjoyed an elevated social authority. This social authority was gained and maintained partly through the momentous discoveries and applications of science, but also through the efforts of certain scientists to address the public directly. Such popularisers hoped to both bridge and maintain the distance between science and the lay public by portraying their activities as specialised, legitimate and utopian. Popular representations of science that surfaced from any other source were potentially a threat to this carefully constructed image and status. It was for this reason that the British Interplanetary Society (BIS) Council, preoccupied with the reputation of their esoteric and atypical Society, was so distrustful of engaging with a mass media that increasingly denied scientific experts direct access to mass lay audiences from the 1930s. In terms of the concept of the common arena, BIS Fellows recognised that media culture was extending its authority over the production of popular scientific representations. Mediated popular scientific representations, especially those constructed to serve the commercial pressures of the media and the interests of the lay audiences, were perceived as inherently problematic and dangerous. Therefore, we see, almost as soon as the deference of production influence to scientific experts was removed, a problem of science in the media was identified. Many scientists saw popularisation as the only 'safe' way of servicing the public demand for popular scientific material, but this concept was incompatible with the motivations of a media culture which held common arena authority.

However, the BIS was too distrustful of engaging with the media to observe that it remained possible for many scientists to directly or indirectly popularise well into the postwar years, largely because of the demand of media professionals and executives for popular material on newsworthy scientific developments such as the space race. Partly this possibility also remained because of the lack of expertise in science and mediating science among the members of media culture. This inexperience was what Phillip Cleator exploited to found, expand and legitimate the BIS. Partly, the continued ability of scientists to popularise was because of source dependence for access to such newsworthy information to form the basis of print media copy and broadcast programmes. Partly, also, when science-mediating specialists – science writers and science broadcasters – did develop, they often forged identities as professional popularisers, which I shall discuss in the next section. In addition, many scientific establishments developed media management and PR techniques that sought to undermine or circumvent the mediating function of journalists and broadcasters. Yet, the main reason why media professionals and executives facilitated the popularisation of scientific experts and institutions was that it was in their interests of attracting audiences to promote positive popular representations of science, such as those that scientists had designed. This coincidence of

interests was seen explicitly in that journalists and broadcasters were complicit in constructing a narrative around the Jodrell Bank radio astronomy observatory telescope project that emphasised a nationalistic spectacle of scientific modernity. Bernard Lovell and the project's supporters and publicists took advantage of this coincidence of interests, and the factors and strategies outlined above, to exploit the fluidity of the common production arena authority to the telescope project's advantage.

For much of the time, then, the problem of science in the media that the BIS Council identified was neither apparent nor evident. Only when the coincidence of interests diverged did tensions emerge at the science-media interface in the common production arena. In such instances, when the Jodrell Bank telescope project ran into financial and political difficulties, for example, authority over the production of popular scientific representations was intensely contested. In these cases, the efforts of scientists and scientific institutions to undermine the mediating identity and expertise of media professionals and executives and influence the popular science agenda were vehemently resisted. The fluidity of the common arena dissipated, and the production authority of media culture was vigorously asserted. This inability of scientific experts to directly popularise to mass lay audiences, and the potential threat to the social authority of science of mediated popular scientific representations, was only an occasional hazard or problem. A number of factors had to combine for these occasional problems to become a persistent issue and mobilise the latent problems of science and the media into a political 'problem' movement. This movement sought to re-negotiate cultural authority over the common production arena so that scientists would be, once again, able to address audiences directly and protect the social authority of science.

BIS Fellows identified that not only were mediated representations of science a concern but also that those professionals that produced these representations were subject to the changing pressures within media culture. Certainly, the intensification of competition for audiences placed an emphasis on public affairs news and entertainment within media culture. Journalists and broadcasters were under increased pressure for their copy and programming to act as industry resources that appealed to audiences. Popular science was no exception in being subject to the vagaries of the fashions of media culture. For example, BIS Council members spoke for many experts when the production of popular scientific material was increasingly permeated with the demands for sensationalism. Of more pressing concern was the demand from media executives that popular science reflect and engage with prevailing popular attitudes to science. From around the mid-1960s, even before the moon landings, popular enthusiasm with science was waning. This was reflected in a smaller proportion of print media copy and broadcast programming being devoted to popular science. Worse still, this waning popular enthusiasm was manifesting itself in a growing popular ambivalence with science. Media professionals and executives, now, in

their bid to attract audiences, actively challenged the social authority of science. The authority of media culture over the common production arena had hitherto retained a deference to science in that it shared the benefits of preserving and promoting the social legitimacy of science, but no longer. Media culture could benefit at the expense of the concerns of the scientific establishment.

The final line of defence for science were the science-mediating specialists that had developed social and professional identities in the arena. The social identity of science writers, certainly, and, to a lesser extent, science broadcasters, contained an expertise in, and a partisanship towards, science. However, their partisanship created a conflict of interest in a dominant media culture seeking to respond to the growing popular ambivalence with science among media audiences. Science writers and broadcasters were either marginalised from the production arena or forced to commit to acting as an industry resource oriented towards the commercial interests of the media and the demands of audiences. Either situation was a further threat to the social authority of science. The problematic professional identity of science-mediating specialists was the catalyst for the latent 'problem' of science in the media to be mobilised into a movement. The aim of this movement on behalf of the scientific establishment was to regain some measure of production influence in order to be able to practice popularisation, or allow science-mediating specialists to do so on their behalf, and reinforce the cultural status of science. This movement polarised and paralysed the common production arena, and evolved into the Public Understanding of Science (PUS) movement of the 1980s concerned with scientific literacy in modern democratic society. Eventually, one outcome of the PUS movement was to encourage and assist scientists to engage with the media in a way that created aligned interests with media professionals and executives. It was in this manner, as well as taking advantage of new media technologies that altered the mechanics of production, that Pillinger and the Beagle 2 publicists were able to render the common arena fluid once again and manipulate in negotiations the production authority of media culture to the mission's advantage. In this later period, science writers and broadcasters also continued to negotiate their identities in the arena. It was only lately, I argue, that these science-mediating specialists demonstrated a utility, expertise and commitment that was compatible with the membership rules and mechanics of the common production arena as determined by the authority of media culture.

'Boundary spanners'

The common production arena, and the shifts in cultural authority over it, is an invaluable tool for explaining the development of science-mediating specialists. For ease of explanation, I suggest that science-mediating specialists should be grouped under two broad terms: science writers and science broadcasters. The term "science writer" encompasses any historical actors who were identified as specialists in mediating science in the print media. Science broadcasters were their equivalents in the broadcasting media. I advocate for these broad terms because there were several different identities among science writers and broadcasters that cannot be adequately categorised by the labels of "science journalists" and "science producers". Perhaps these professional identities did emerge eventually, but their development was complex. The reason why the development of science writers and broadcasters was so complex was that they were seeking to forge an identity in a common production arena whose rules were themselves in constant flux. As the rules of the arena changed so did the expertise requirements for occupying membership of the arena. Eventually, the rules of the arena changed such that science-mediating specialists were either marginalised or forced to accede to the production authority and commercial interests of media culture in attracting audiences. This was the final catalyst for the latent 'problem' of science in the media to be mobilised.

The increased public demand for popular scientific material in the interwar years provided the opportunity for science-mediating specialists to develop. This demand placed pressure on the members of the arena to produce more popular science. At the time, authority over the arena was held by scientific culture, with scientists generating popular scientific material that was subsequently disseminated to mass lay audiences by media professionals and executives. However, this arrangement in the arena placed media actors at a disadvantage: they were at the behest of scientific experts to produce the copy and programming that their audiences were demanding. This tradition of popularisation was advantageous to the scientific community, such as the BIS, in that only selected representations of science would circulate popularly. Yet, journalists and broadcasters wanted to supply their audiences with regular and distinctive popular scientific material as an industry resource. Because media professionals and executives regulated access to platforms and audiences, the cultural authority in the common production arena began to shift. Print media editors and proprietors and broadcast executives recognised the value of producing popular science on their own terms rather than facilitating the popularisation of scientists. It was as the authority over the arena of scientific culture was being challenged that the first science-mediating specialists emerged who sought to forge an identity in the arena. At this time, the demonstrable expertise required to gain membership of the arena was far from clear.

Science writers such as JG Crowther and Ritchie Calder recognised these changes in the common production arena and the opportunity they provided to forge a specialist science-mediating identity. Both recognised that the scientific community was concerned at the challenge to scientists' direct access to lay audiences, and were personally motivated to redress the potential threat to the social authority of science. Both also recognised that there was an inexperience in the advancing media culture in producing popular scientific material that would be of value in print industry competition for readers. Above all, Calder and Crowther recognised that neither media nor scientific culture held full authority over the common production arena. Therefore, they had to demonstrate a commitment to, and utility in, the cultures of both media and science. In practice, this entailed demonstrating an expertise in popularisation that sought to reinforce the public appreciation of science and in acting as science journalists who sought to provide copy to editors and publishers that would attract readers. This dual component of their identities, necessitated by conditions in the arena, marks the likes of Crowther and Calder out as 'boundary spanners'. In terms of actors' categories, these boundary spanner science writers were scientific journalists. Interwar science broadcasters had a significantly different development. The opportunity for a specialist broadcasting science-mediating identity to emerge was, again, provided by public demand for popular science programming. Yet, from the outset the rules of the common science broadcasting production arena were different. The nature of broadcasting technology meant that expertise in broadcasting technique was paramount. Consequently, the authority of media culture over the common production arena extended much further much more quickly. Broadcast producers such as Mary Adams seeking to forge an identity in the arena as specialists in science programming, thus, had to foreground their media commitment and expertise much more than did science writers.

It was this foregrounding of media commitment and expertise that allowed science broadcasters – later including broadcast science journalists as well as specialist science producers – to consolidate their identity in the common production arena. This consolidation proceeded by adapting more readily to the demands of, and negotiating within, media culture, and marginally so with scientific culture. By demonstrating their ability to produce programming that would play a significant role in the BBC's ratings war, science broadcasters forged a valuable science-mediating identity. In addition, the public service mandate of the BBC, which meant that its output had to be educational and informative as well as entertaining, science broadcasters also demonstrated a secondary commitment to and expertise in science and its popularisation. Science writers, however, had much less secure social and professional identities in their common production arena. Their partisanship to science became an increasing conflict of interest in an arena in which media culture increasingly held authority and which favoured the concept of science journalism over scientific journalism. In the postwar years, with competition for media

audiences intensifying, editors and publishers were more eager than ever to supply audiences with the latest news of developments in the space age. Print media executives and proprietors sought science writers who were willing and able to report on science in a way that resonated with the interests and attitudes of readers rather than seeking to build public appreciation of science, although this was the case for much of the period with the likes of John Maddox. Even the embedded scientific sympathies and susceptibilities of science broadcasters became a problem when it became clear that the media could gain from the growing popular ambivalence with science. The conflict of interest was largely untenable in the common science writing production arena as science writers, the demand for whose services provided them with a sense of professional irreplaceability, clung to an identity that stressed intercultural communication and expertise in media and science rather than communicating within media culture and presenting science for lay audiences in support of commercial interests.

Many science broadcasters, such as Aubrey Singer, made an open commitment to adhering to the requirements of membership for the arena dominated by media culture. Singer committed to acting as a specialist broadcasting industry resource. Science writers, on the other hand, and certain science broadcasters, resisted making this commitment. There was, in fact, much resistance to this commitment that disavowed any partisanship to and expertise in science and popularisation and which constructed science producers and science journalists as marginal and disposable specialist resources in fickle industries that responded to waning popular enthusiasm with science. Such tensions played a major role in the mobilisation of the latent 'problem' of science and the media. Many science writers and broadcasters, especially through the ABSW, aligned themselves with the movement that sought to redraw the cultural authority of the production arena and allow the scientific community to implement popularisation that would allow them to counter the growing popular ambivalence with science. However, this movement, and the subsequent PUS movement, could not undermine the production authority of media culture in the common arenas. Even science writers in the ABSW recognised this fact and agreed to further foreground their print media commitment and expertise. This did not mean that gaining a production influence in a common arena dominated by media culture was a lost cause for scientists. The case of Beagle 2 showed how playing to the interests of media actors can provide scientists with much negotiating power, and that developments in media technology can change the mechanics of the production arena itself and allow unmediated access to audiences. That science might once again be able to reciprocally exploit the media will alter the interactions at the science-media interface.

Further development and contribution to the discourse on science, media and the public

Since the PUS movement emerged in the 1980s there has been significant academic and political discourse surrounding the notion of an informed citizenry in an advanced democratic society. As one of the primary means to develop this scientific literacy, science communication has been the subject of much scrutiny. As one of the principal channels of science communication, much attention has been paid to studying science in the media, with various scholars and commentators constructing both problems and solutions therein. By approaching the science-media interface historically, I contribute to such discourse by offering a conceptual framework that explains how such problems were constructed, and a new approach to devising solutions to these problems. In putting forth the notion of a common production arena, I aid symmetrical understandings of the complex interactions at the science-media interface from which popular scientific representations emerge. Embracing the idea of popular scientific representations as a boundary object exposes the agendas and approaches of scientists, media professionals and science-mediating specialists in their production. I identify media culture, especially competition for audiences, and media technology, as the major driving influences over production but also that negotiations are frequently fluid and allow scientific experts much influence. These driving influences, I also argue, contributed to the historical construction of the 'problem' of science and the media and the professional ambiguity of science writers and broadcasters.

It should be noted, however, that my source base and analytical framework in this thesis, despite my challenge to scholars in the introduction, are not without their deficiencies, and that there is ample opportunity for fruitful future research and development. Seeking to connect with the burgeoning research school of European astroculture scholars in Berlin would be a strong first step.[5] In terms of specific deficiencies, first of all, the voices of certain actors are absent. A *Guardian*- or *Times*-style archive for a tabloid newspaper would provide further insights into how popular science production was absorbed within media culture, and as to how science journalism was constructed as an industry resource in a more populist outlet. The thus-far absent archives of more recent practising science writers would be a welcome addition to the investigative field, especially someone like *Daily Mirror* Science Editor Ronald Bedford, or John Maddox, who was prominent in both the press and magazine science industries, to understand how science writers reconciled their boundary spanner identities with the production authority of media culture. Similarly, the opening up of historical material from non-BBC broadcasting organisations would bring insights into how both broadcast science production and journalism developed

[5] For more on this growing field see: ACT Geppert (forthcoming 2011).

in commercial television in particular, in outlets less constrained by a public service mandate, as well as providing a more symmetrical picture of the impact of satellite communications on British broadcasting. There is certainly more work to be done on the development of broadcast science journalism, and how this identity within science broadcasting was forged in negotiations between scientists and broadcast producers and executives. It may be said that broadcast science journalists were even more suited to the arena than producers specialising in science programming. In addition, there is a certain amount of urgency required to obtain the oral testimony of science broadcasting veterans, such as *The Sky at Night* presenter and producer Patrick Moore, to triangulate my arguments on the history of science and broadcasting. If such further work was completed, it is likely that further science-mediating specialist identities, such as further types of science broadcaster, may be identified. In turn, this would allow the scholar to usefully connect with, and contribute to, the literature on journalism, historical or otherwise, for example, in terms of the contingencies of formalising and institutionalising a specialist journalistic profession. I urge scholars to conduct similar analyses but oriented around the co-construction of media products rather than the notion of the common arena.

More broadly, now, there is certainly scope for a more thorough investigation of the development of the production of popular scientific material in other mass media, such as newsreel, museums and film, books and periodicals, to complete the exploration of the utility of the notion of a common production arena and especially the influence of media technology. In fact, following the approach of Anthony Smith, there could be a case for approaching future, similar studies to my own from the perspective of the impact of new media technologies. A sub-theme running through my thesis that could have been drawn out more, certainly, is how media technological developments – cheaper printing, radio, television, satellite broadcasting, and the Internet – combined with perceived public demand for popular scientific material. As seen most clearly in chapter five, new media technologies tended to drive the expectation of increased competition for audiences in the industries and, thus, tended to favour more populist media cultures. Such populism, in turn, elevated the importance of expertise in producing programming that would entertain audiences. Consequently, membership of the common production arenas (or presence at production negotiations) in each industry gradually came to be determined by the authority of media culture and the demands for media expertise. However, as we will see below, recent media technological developments, and especially the Internet, have allowed scientists to challenge the authority of media culture over production.

Conducting a similar study with disciplines other than space science as investigative tools would also likely yield complementary revelations. Indeed, there may be significantly different lessons to be learned about the development of the science-media interface by disaggregating the production of popular space science material into its constituent

disciplines. I have treated space science somewhat monolithically and I suspect an analysis that treated astronomy, cosmology, astronautics, etc, separately would reveal further nuances in the motivations and approaches brought to the production negotiations. This is particularly the case for an atypical group like the BIS, therefore comparators with more mainstream astronomical societies or aviation groups would provide useful contrasts.

In addition, I appreciate that there is certainly some justification for studying science in the media using this conceptual framework in the period following the moon landings. Indeed, it would be rewarding and worthwhile to analyse the agendas in and attempts of the scientific community to wrest back control of the production agenda from media culture, and restore their direct popularisation links to the public, through the political rhetoric of the 'problem' of science in the media and PUS movements. Opportunities here, at least from the angle of space science, lie in further scrutiny of the efforts of Alan Bond to gain support for his 'British Shuttle', and the press archive of the Beagle 2 campaign at the Open University. Indeed, as indicated in the tentative explorations of the Beagle 2 campaign in the introduction, this was an explicit attempt by Pillinger and his allies to reverse the prevailing production relationship. Certainly, there is scope for an investigation of how modern media technologies are affecting science communication. Beagle 2 showed that social media changed the mechanics and power relationships of production and allowed Pillinger and his publicity allies to address the public relatively unmediated. Such changes favour the production authority of scientific culture and allow it to begin to manipulate negotiations with writers and broadcasters to exploit the media in return as the media had done so successfully across the twentieth century. In particular, the potential for recent media technologies, and their associated techniques, to democratise or rebalance production authority would benefit from further detailed scrutiny.

Despite these weaknesses, I assert that this thesis is a valuable contribution to the scholarly discourse on science and the media. The concepts of the common production arena and popular scientific representations as contested boundary objects, in particular, are useful for seeking to unravel how and why the media and science shape and seek to exploit each other. At a time when collaboration is increasingly urged between the cultures of science and the media, academics yet remain convinced of a polarising cultural dichotomy, the notion of a shared negotiating space is a step forwards for actors and scholars.[6] However, it must be added that maintaining a certain amount of cultural difference is essential if each community is to fulfil its unique social role, and, indeed, the tension itself can be healthy for modern democratic society.[7] The issue and study of science and the media is unlikely to disappear soon, but the notion of a common

[6] For example, see: B Fjæstad (2007): 123-124.

[7] D Nelkin (1987): 181-182.

production arena is a step towards providing a framework for scientists, media professionals and executives, and science-mediating specialists, to aid their understanding of each other's perspectives and roles in approaching interactions. The complexities of the interactions in the science-media interface are not so complex when approached from this analytical framework, and boil down to the fact that popular scientific representations are valuable to different cultures and social identities in different ways. The ways in which these representations are valuable predicate whether the arena is fluid or contested, and also hint at the path to developing a constructivist encounter model for characterising the developments and context of production of mass media popular science. This original study, founded on an unrivalled breadth and depth of primary sources, has shown that the often-elusive production context of science and the media can be fruitfully analysed longitudinally, in-depth and, most importantly, symmetrically.

Scholars of science and the media often seek to describe and characterise the science-media interface but struggle to explore and explain the important but complex context of production at the interface. I put forward the notion of a 'common arena' as a tool that facilitates a symmetrical analysis of the complexities and developments. In this conceptual framework, popular scientific material is treated as a 'boundary object' whose production is negotiated by the cultures of science and the media and the identities of science-mediating specialists. Such boundary objects, in this case relating to high profile space science across the middle part of the twentieth century, it emerges, are of value to diverse scientific and media actors, and both cultures, and specialist science-mediating identities, seek to demonstrate and restrict the expertise necessary for membership of the arena and, thus, for influence over the production of popular scientific representations. It is a challenging area to study, and, though the conceptual framework is not without its analytical limitations, one which can begin to point the way to how to reveal why science and the media shape, and have shaped, each other.

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