

Science and film-making

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Abstract

The essay reviews the literature, mostly historical, on the relationship between science and film-making, with a focus on the science documentary. It then discusses the circumstances of the emergence of the wildlife making-of documentary genre. The thesis examined here is that since the early days of cinema, film-making has evolved from being subordinate to science, to being an equal partner in the production of knowledge, controlled by non-scientists.

Keywords: Science documentary; Science and Film; Science TV; Film-Making; Wildlife Making-of Documentary; Formalism.

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1. Introduction

Cinema goers in 2013 could revel in the adventures of a young chimpanzee, Oscar, taken care of by Freddy, a dominant male, brought to them by Disney's film-makers.¹ Amongst the narratives put forward to advertise the documentary was the astonishment of scientific advisers, when faced with Freddy's altruistic behaviour. Instead of slaughtering the young one, as textbooks would have led them to expect, the alpha male was taking care of him. In the words of Christophe Boesch, veteran chimpanzee observer and the film's principal adviser: 'I have never seen a male like Freddy take up the role of a mother like that'.² Through their participation in the film-making process, scientists had witnessed a hitherto unknown behaviour. This story presents film-making as a participation in the generation of new knowledge about the natural world.

To understand the contribution of science films to the public culture of science, this essay adopts a relational approach, focusing on how film-makers and scientists relate to each other through film-making, and how audiences are enrolled in this relationship. The opening anecdote reverses the taken-for-granted stream of the flow of knowledge, from expert scientists through appointed popularisers to an ignorant public. Instead, here knowledge originates from a collaboration between scientists and film-makers whilst viewers are invited to reproduce for themselves field observations, the evidence on which knowledge-claims concerning animal behaviour are based. Participating as witnesses, in this case of knowledge creation, viewers are involved in its legitimisation (Shapin and Schaffer,

1985). If, then, film-making is a technology for science-making in public, it turns the production of knowledge into a distributed process whereby scientists, film-makers and audiences take part in a complex process whereby producer, text and receiver cooperate in a collective enterprise of meaning construction (Silverstone, 1988: 232; De Cheveigne, 1999: 186). This perspective highlights film's capacity to question the authority culturally vested in the sciences and their practitioners. As we will see, from the early days of cinema, this feature is central to the debates about the medium's epistemic value, and how it relates to science.

The working thesis of this article, based on a review of recent science studies literature on the topic, is that from its origin in the last decades of the nineteenth century to the 1960s, film-making has moved from the position of being a technology serving science to being an equal partner and reflexive maker of science. Central to this evolution are the material means of film-making, the institutions, social relationships, the values and beliefs assembled around the practice, all that is contained in the phrase 'the film-making apparatus'. Although films, or television programmes, are public representations of the knowledge produced by scientific practitioners, films are composite objects, whose epistemology is as much determined by their subject matter as it is by the medium (Van Dijck, 2006). They operate according to rules and conventions defined outside the cultural space of science (Mitman, 1999; Boon, 2008; Jones, 2014). Films originate in distinctive professional cultures whose participants actively maintain their autonomy and identity as it resides in their film-making capability.³

In examining how scientific knowledge and the film medium relate to each other, this essay concentrates on the science documentary genre.⁴

Documentary is an imprecise label applied to 'certain kinds of film and television ...which reflect and report on "the real" through the use of the recorded images and sounds of actuality' (Corner, 1996: 2). Documentary is a Janus-faced genre, at the same time evidence and artifice (Corner, 1996). And the relationship of science with the film medium hinges on this duality.

From the start, documentary 'has had a contested relationship with the truth, as well as pre-dating fictional features' (Lee-Wright, 2014: 426).

Documentary theorists have written at length about documentarists' performative use of staging, reconstruction, story-telling, in order to get at "truths" about the social world (Winston, 2008; Williams, 2005; Corner, 1996). The same can be said about the physical/natural world. A connected theme in this literature is film-makers reflexively accounting for the necessary constructed nature of their works while laying claims on the real (e.g.: Ruby, 2005, Bruzzi, 2006). An example of such reflexive account is the wildlife making-of documentary (MOD) genre. MODs emphasise artifice and performance as essential if films are to stand as evidence, and ultimately frame the film-maker-scientist relationship as reciprocal for the production of knowledge.

The article starts with a review of the history of the relationship between film-making and science, from the early days of cinema onwards. The trajectory follows the camera as it escapes scientists' hands to land into film-makers'. This takes us to the 1960s when, science film-making having been

relocated on television, film-makers stand as technical experts in their own right, capable of contributing to the scientific enterprise. The wildlife MOD genre appears at this point, as an equivalent to the “material and methods” section in a scientific article. The short case study of the genre’s origin is intended to examine in more detail a specific instance of the public framing of the relationship between scientists and film-makers. The article concludes with suggestions that future research on the topic should involve transnational and intermedial comparisons, as well as an increased focus on audiences.

2. From science- to film-making.

2.1. Film as the mechanical reproduction of scientific observation

Early developments in film technology were a driving force of the history of the sciences. They led to the development of new practices of knowledge production, and the constitution of new objects of knowledge (Bigg, 2010; Landecker, 2006; Wellman, 2011). Three names are conventionally associated with the first efforts conducted in the 1870s and 1880s to find ways of capturing movement; those of astronomer Jules Janssen, photographer Eadweard Muybridge, and physiologist Etienne-Jules Marey. All devised and perfected chronophotographic devices to take sequences of photographs which could then serve to analyse how celestial bodies, humans, or animals move (Canales, 2011).

It would of course be erroneous to think of chronophotography as a precursor of film and cinema. It is historically contingent, situated in time and space, and neither Janssen, Marey, Muybridge, nor their audiences

experienced it 'as [a milestone] on the way to twentieth-century cinema' (Morus, 2006:104). Nonetheless, in the 1890s, Edison and the Lumière Brothers built on chronophotography to produce what eventually became entertainment cinema, and a source of profit (Chanana, 1996). Part of their strategy was to emphasise cinema's scientific origin, capitalising on the taste of the day for combinations of entertainment and edification (Morus, 2006). So much so that Marey feeling dispossessed of his invention, tried to establish a clear boundary between chronophotography and cinematography (Canales, 2011; Gaycken, 2012; Mannoni, 2012). Instead, other scientific practitioners embraced film technology, carefully distinguishing between its scientific and non-scientific uses. For instance, members of the German medical community, who used film in their research, defined as scientific observation the way they recorded and watched films, but castigated as mere spectatorship the way non-specialist audiences consumed them, even claiming that uneducated film spectatorship could potentially be harmful to people's physical and mental health (Curtis, 2009). Meanwhile, a good share of the first films shown in amusement halls were of subjects which could be labelled "scientific", like zoo animals, micro-organisms, or machines (Boon, 2008; Burt, 2002; Gaycken, 2002). Film historian Tom Gunning has named this early cinema 'cinema of attraction' (Gunning, 1986). Non-narrative, 'exhibitionist', based on 'its ability to *show* something' (p.64 – original emphasis), its entertainment value lay as much in what it showed as in showing it. Using a technology, whose accuracy could be vouched for by scientists, to produce and display records of moving natural phenomena, early film-makers elicited

wonder for the new technology, whilst soliciting trust for themselves and their practice from their audiences (Nadis, 2005). This origin story shows that, although its scientific ascendancy is strong (Winston, 2008), film-making encapsulates from its inception a tension between artifice/entertainment on one side, and evidence/science on the other. Its meanings and significance in relation to science were, from the start actively disputed, which prompted further definition of what science is, what it means to practise it, and who is authorised to do so. Throughout the first half of the 20th century the relationship between science and film, knowledge production and entertainment, remained imprecise (Boon, 2008; Gaycken, 2011; Landecker 2006).⁵

2.2. Enter the cine-scientist

Key to this history is a gallery of individuals whose biographies stand as evidence that throughout the first half of the 20th century, simultaneously as cinematography was developing into a technology for producing entertainment, it retained advocates within the scientific community (Landecker, 2006). Frenchmen Jean Comandon (Garandau, 2012), Jean Perrin (Bigg, 2010) and Jean Painlevé (Beattie, 2008; Bellows & McDougall, 2000; Fretz, 2010), Englishmen Percy Smith (Boon, 2008), Cherry Kearton (Gouyon, 2011a), and Francis Martin Duncan (Gaycken, 2011), or the Italian Roberto Omegna (Ceglia, 2011), all are European examples of the “cine-scientist”⁶. Working towards fashioning film-making as a legitimate technique for scientific investigation, they were at the same time producing

footage for non-specialist audiences. For all were, at some point in their career, employed by companies also producing entertainment, such as Pathé or Gaumont, keen on having scientific films added to their catalogue. And often footage produced in the first place to address a specialist audience would find its way into these companies' catalogues as part of the shows that toured the amusement halls circuit.⁷ For example, in July 1910 French company Pathé offered in Paris a programme titled "*La Cinématographie ultramicroscopique*", composed of such films by Jean Comandon as *Trypanosoma brucei*⁸, presenting ultramicroscopic views of an infected mouse's blood, previously shown at the Paris Académie des Sciences in October 1909.

A heterogeneous group, cine-scientists worked creatively during the first half of the 20th century to develop film-making as a technique of observation which could be used as a reliable means of knowing the world and circulate this knowledge to convince scientists and non-scientists alike (Gaycken, 2011). Some, like Omegna, Kearton or Smith, were film-makers eager to appropriate the cultural authority vested in Science, so as to enhance the status of cinema, and their own status as film-makers. Others, like Comandon, were trained and practising scientists. They tried to convince their peers that film should enter the laboratory because it rendered visible what the unaided eye could not otherwise see, and it generated visual artefacts which could serve as demonstration devices to colleagues, students, or larger and more diverse audiences: 'Projected on a screen ... these images enable us to reproduce the real aspect of the preparations.

[They] can therefore, we believe, be of great utility for teaching and popularising science.’ (Comandon quoted in Lefebvre, 2012: 17). Based on a strong commitment to observational realism, film was thought to enable the circulation to larger audiences of actual objects of knowledge. From this vantage-point, film was the technology that would open up the laboratory to public witnessing, enrolling audiences in the legitimisation of knowledge claims, and democratically linking science to society.

However, although after the Second World War, science became even more central to people's lives, cine-scientists' idealistic views lost currency in scientific circles. This can to some extent be correlated with a broader evolution of post-WWII science towards industrialisation and the development of practices governed by ownership, property and secrecy. But corporate science was already a feature of the beginning of the 20th century (Shapin, 2008). And as is exemplified by the case of Pathé, who funded and equipped laboratories for the purpose of producing scientific footage, the development of scientific film-making took place in a corporate context.

Another potential cause for the post-1945 fading of cine-scientists is related to film-makers' efforts to constitute their practice as a profession. These efforts were favoured by the emergence of the new institutional setting of television, which became in the post-war the medium of choice for the diffusion and consumption of science films and documentaries (Boon, 2013).

2.3. Turning science film-making into a profession, on television

In the wake of the Second World War, the relationship between science and

film, film-makers and scientists, changed dramatically, the entire landscape of the popularization of science evolving towards an increased professionalisation (Gregory and Miller, 1998). During most of the 1950s, those active throughout the inter-war period producing scientific films for the cinema persisted in doing so, whilst starting to transfer to television (Boon, 2013). In this period, television producers were still learning the ropes, and perceived scientific knowledge as a resource for fashioning television as a medium worthy of trust (Farry and Kirby, 2012). Meanwhile scientific practitioners anxious to establish new disciplines, like ethology for example (Davies, 2000a, b), were willing to use television to gain public support for these new fields of enquiry. Overall, the give and take relationship between science and television was favoured by the belief, prevailing amongst the Western Establishment in these early cold war years, that a strong visibility of scientific and technological knowledge in the public sphere would help strengthen national power (Agar, 2014; Ortolano, 2009). In the words of Ian Jacobs, Director General of the BBC in 1956: 'Our national position depends a great deal upon our standing with that part of the nation which is responsible for and actively concerned with political, economic and scientific matters' (Jacob, 1956, quoted in Boon and Gouyon, 2014: 473). But this *status quo* was short-lived. Conceiving of science broadcasting as primarily a means of educating non-scientists, scientists tended to favour programme formats of the filmed-lecture type (Boon, 2014). They showed little interest in 'the principles of programme structure, and the demands of dramatic form' (Singer, 1966a:9). By contrast, broadcasters envisaged science broadcasting as 'not ... blindly putting our

skills and equipment at the disposal of those who want to communicate with it. The essence of our public service is to ensure that broadcasting fulfils the needs of our audience' (Singer, 1966a:18).

This quotation concludes the lunch-time lecture 'Science Broadcasting' which Aubrey Singer, head of the outside broadcast, science and features department at the BBC, delivered in February 1966. It declares that broadcasters should be free from scientists' oversight and, through the notion of public service broadcasting, only be accountable to audiences. From the early 1960s onwards, broadcasters began making clear that 'as a foundation to our policy, we have firmly decided that *the broadcasting of science shall be in the hands of broadcasters*' (Singer, 1966a: 8, original emphasis). A strong division of labour between scientists and film-makers progressively became instituted. Scientists were to produce the facts which film-makers would then use to create elaborate audio-visual artefacts fit for public consumption (Gouyon, 2011b; Jones, 2014).

Singer's 1966 lunch-time lecture was intended to outline broadcasters' territory. There he forcefully asserted that 'the televising of science is *a process of television....* Therefore, in taking programme decisions, priority must be given to the medium rather than scientific pedantry' (Singer, 1966a:13, original emphasis). To summarise, in the 1960s, control over knowledge for the purposes of public consumption was taken out of scientists' hands and appropriated by broadcasters. A consequence was that from this point onwards it became difficult to be at the same time a scientist and a film-maker. Bridges existed, scientists could become television

producers, but they had to forgo being scientists (Gouyon, 2011b).

Robert W. Reid is a case in point. After a PhD in physics from Cambridge, he began in 1963 a career as a programme-maker at the BBC, in the Talks department. Owing to his reputation as the producer of two films on the history of particle physics, *Einstein* and the remarkable *The Building of the Bomb*, both broadcast in 1965, he became editor of the BBC series *Horizon* in 1967 (Boon, 2014). In 1969, when head of the science and features department, he published a paper in the journal *Nature* titled 'Television Producer and Scientist'. Probably reflecting on his own experience, Reid echoes here Singer's 1966 lecture:

If he carries out his new role well, he has to acquire the professional skill and experience of a producer, and devote a producer's time and energy to his programme. *He will cease to be a scientist*. To that extent one functionary is replaced by another and broadcasting is back in the hands of the broadcasters. (Reid, 1969: 458 – emphasis added)

This is not to say that scientists ceased altogether to use film and the motion picture camera for research purposes in the 1950s-1960s. The *Encyclopaedia Cinematographica*, a collection of biological, ethnological and technological films, specifically documenting phenomena of which movement is an essential dimension, is evidence of the contrary. This international collaborative project was initiated in 1952 at the German Institut für den Wissenschaftlichen Film, in Göttingen. Intended both as reference for research work and resource for teaching, it was maintained until 1994 (Wolf, 1972).⁹ Throughout it kept alive the original essence of cinematography, as a

means of capturing movement. As the project's initiator, Gotthard Wolf, explained:

The encyclopaedia film is so planned that it contains a great degree of reality. It is always made under the supervision of a scientist, and great care is taken to make sure that any unintentional ambiguity in the film is avoided. (Wolf, 1972: 4).

The *Encyclopaedia Cinematographica* rested on cine-scientists' belief in observational realism and in the evidential value of the film medium, as a means of recording and circulating unproblematic objective observations. This quote indeed establishes an inverse proportion between artifice and the evidential value of the film. As the next section considers, in relation to the development of the wildlife MOD genre, film-makers took the opposite route, claiming on the contrary that artifice is essential if film is to work as evidence.

On a few instances, footage from the Encyclopaedia found its way in television programmes.¹⁰ But these may be exceptions rather than the rule. On the whole, the Encyclopaedia films remained in scientific circles. Such isolation materialises the notion that from the 1960s onwards, the camera, as a means of making science public, escapes scientists' control. Should they wish to address non-specialist audiences through popular media like cinema, and increasingly television, they had to leave the matter to other experts, film-makers. This new found expertise translated, for these latter, in the capacity to fashion science broadcasting as not merely a representation of the end product of scientists' work, but as a participation in the production

of knowledge. In a paper published in 1966, the year of the BBC lunch-time lecture, Aubrey Singer put it unambiguously:

There are times when television acts in its own right, ..., when it uses its power of communication not merely to convey other people's images but rather *to create out of its potentialities its own genuine statements*. ... When we do we can claim equal responsibility with those who create the values of society. With architects, authors, scientists, designers, film-makers, with all those who create and communicate original work. (Singer, 1966b: 305-emphasis added)

By the 1960s, science television producers could claim to be on equal epistemic footing with scientists, when it came to producing original statements about the material and the natural world. And indeed television broadcasting as a whole was framed as a technoscientific enterprise. The material processes of broadcasting, especially the development of satellite communication, were significant in that regard (Farry and Kirby, 2012).

2.4. Fashioning science broadcasting as participation in science

Several television programmes on satellite research used the processes of television broadcasting to explain, or practically demonstrate signal transmission. An early example is the 1958 BBC programme *Frontiers of Science* 'New Moons'. In order to demonstrate information transmission from a satellite to receiving stations on earth, the mock-up of an artificial satellite, equipped with genuine receptors and transmitters, was positioned

on the roof of the BBC Lime Grove Studios to broadcast measures of cosmic rays, atmospheric pressure, micro-meteorite impacts, and temperature to the BBC Riverside Studios in Hammersmith, a few miles away. The whole experiment was performed live with scientists involved in satellite research present in each location.¹¹

Building on such collaborations, links were subsequently established between the BBC Talks department and the Institute of Electrical Engineers in order to explore potential applications to broadcasting of advances in transmissions technology. These links were subsequently advertised in programmes like *Telstar Calling: Story of the First Communications Satellite* (BBC, 1962) broadcast on 26 July 1962 to celebrate the first transatlantic exchange of live television (Farry and Kirby, 2012:16). The previous section discussed how foregrounding the technicality of television broadcasting, and the expertise it requires, allowed for establishing a distance between broadcasters and scientists when it came to representing science in public. Here, we see how it simultaneously enabled broadcasters to build and advertise collaborative links with scientific bodies. These two seemingly opposite movements, distance setting and collaboration, open a space where film-making can be a participation in science, under film-makers' control. But if film-making is to be considered legitimate as a way of producing knowledge, film-makers need to account for their methods and techniques. This reflexive turn took place quite visibly in wildlife film-making with the emergence, at the same moment, of the wildlife making-of documentary (MOD). As science films and documentaries go, wildlife films

are amongst the most constructed (Mitman, 1999). To the extent that some media scholars, equating science film with observational realism, have claimed that they have little to do with science (Bousé, 2000). However, as we will see, this is precisely the conception which wildlife MODs set out to dispel, promoting the formalist view that construction and artifice are precisely that which enables film-making to participate in the production of knowledge.

3. Film-making: material and methods

Between 1963 and 1990, several attempts at producing wildlife making-of documentaries (MODs) took place. To some extent, MODs have roots in a culture of television-making which, through controlled disclosure, inscribes broadcasting into a narrative of technological achievement. A week before the start of television transmission in Britain the *Radio Times* featured a guided tour of the new BBC television headquarters at Alexandra Palace, complete with a photograph of ‘the Baird Control Room’ (Radio Times, 1936). Yet, wildlife MODs offer more than a quick glance behind the curtain, as they define film-making’s relationship to science-making.

3.1. Representation as intervention

The first documented attempt at producing a film dedicated to depicting the practicalities of wildlife film-making is the 1963 *Unarmed Hunters* (BBC, 1963). Shot almost exclusively inside and around the premises housing the

BBC Natural History Unit (NHU) on Whiteladies Road in Bristol, the documentary adopts the visual conventions of natural history films, a succession of close-ups contextualised with establishing and medium shots (Parsons, 1971), to present the work conducted there over a period of a few days. The close-ups direct the gaze towards stacks of reels in the film library, pieces of equipment used for editing, dubbing, or hands pushing or turning knobs and buttons. The visual style of natural history film-making is thus turned back onto the practice itself, foregrounding the materiality of film-making.

The contexts of production and display indicate that *Unarmed Hunters* was meant to legitimate such techniques as filming under controlled conditions or dubbing, as valid natural historical methods, and not as fakery. In the early 1960s at the NHU, the culture of professional film-making was starting to supersede that of amateur natural history, as amateur natural history cameramen's input was progressively replaced by that of professional wildlife film-makers (Davies, 2000b). *Unarmed Hunters* was initially produced as part of the BBC offering for the 1963 National Nature Week. Sponsored by the Council for Nature, this festival was meant to 'gain more public support for the natural history movement'.¹² Screened there, *Unarmed Hunters* asserted that professional film-making is part of the natural history movement. In this regard, a sequence showing Peter Scott, the arch amateur natural history cameraman, shooting on location and being instructed by his producer Eileen Moloney on when and how to deliver a line, with cue cards appearing on screen, can be interpreted as expressing

the fading of the commitment to observational realism in favour of a more formalist, constructivist approach. Following the festival, the film appeared several times on television. But it was also shown, throughout the decade, at meetings of natural history societies across Britain.¹³ As the only film in its library over the rights of which the NHU had complete control, it could be lent or rented at the NHU's discretion, without referring to Television Enterprise, the BBC department commercially exploiting programmes (Crocker, 1964). Circulating the film in the amateur natural history community was meant to convince practicing naturalists of the relevance of film-making for the production of valuable natural historical knowledge, and to uphold the NHU's standing within this community. *Unarmed Hunters* participates in the process whereby the televising of natural history is transformed into a skilled technical enterprise, centred on the mastery of the film-making apparatus and controlled in Bristol. It asserts that rather than a source of error and misconceptions about the natural world, the construction work involved in producing representations of nature on screen is evidence of film-makers' ingenuity, and necessary if the films are to work as reliable sources of knowledge of the natural world.

Amateur naturalist cameramen conceived of the film-making apparatus as unquestionably transparent, the unobtrusive camera merely recording what would be happening were it absent. By contrast, *Unarmed Hunters* puts forward a more formalist approach to film-making. Rather than representing an intangible reality, the film originates in the encounter between the film-making apparatus on one side and nature on the other, filmed nature being

positively characterised here as an enhanced version of the natural world.

This approach became further elaborated in the following decade with *The Making of a Natural History Film* (hereafter TMONHF - BBC, 1972), which depicts the specialised film unit Oxford Scientific Films at work. Just like *Unarmed Hunters*, it emphasises the transformative power of the film-making apparatus on spectators' perception of nature. And in the same movement it asserts the expertise of those able to enact such power through their control of the apparatus. As the closing commentary goes:

Perhaps seeing how they do it will make other films like it seem more real. For, although the stories are often filmed in studios, they are true reflections of what takes place in nature, all around us, all the time. (BBC, 1972)

In TMONHF, film-making is defined as a performance of nature. One sequence shows how a living embryo is extracted from a hen's egg and then filmed. Another depicts an ingenious device to film the capture of a fly in a pitcher plant as if observing it from the bottom of the plant. These sequences repeatedly assert that artifice, the intervention of the film-making apparatus, is indispensable for the truthful representation of nature on screen to occur. The natural history film-makers portrayed in TMONHF turn the film studio into a kind of laboratory, a place where knowledge is produced by means of film-making. There bricolage is the norm, as fragments of nature, plants and live animals, are brought in, away from the vagaries of the outside world, to be observed using elaborate filming techniques. Rather than a mode of distanced observation, filming is defined

here as a mode of inquiry, which enables viewers to experience such mundane objects as an egg from a new perspective, adding a sense of wonder to it.

This notion that wildlife film-making is a performative form of knowledge production was further developed during the next decade, in relation to the production of the NHU's first two major 'Attenborough' series, *Life on Earth* (BBC, 1979) and *The Living Planet* (BBC, 1984). Whilst a making of *Life on Earth* was planned but eventually never produced,¹⁴ in interviews to promote the series upon its release, David Attenborough emphasised the epistemic power of film-making, foregrounding the materiality of the television display and of the way it was constructed: 'We were able, for instance, to put together views of living amphibians which no one had been able to see in that range of time ever. No zoo could show you that amount. The visual effect was devastating.' (Whapshott, 1980). Here editing is foregrounded as a means of constructing points of view that can bring an understanding of the natural world which other forms of displays of natural objects—such as zoo exhibitions—cannot. Next came *The Making of the Living Planet* (BBC, 1984). But although it was the first wildlife MOD actually produced in conjunction with a series, it should be seen as validating the process initiated in 1963 with *Unarmed Hunters*, much more than as initiating a trend. As humourist Miles Kington intones in his opening commentary, 'The trouble with nature is it does not know when it is meant to be collaborating' (BBC, 1984). Accordingly, the MOD shows film-makers using 'all their natural low cunning and perseverance in order to play nature

at its own game' (BBC, 1984). From the imprinting of wild geese, so that they can be filmed flying in close up, to the reconstitution of a patch of the Pacific Ocean's floor in a studio, *The Making of the Living Planet* reveals every trick. Here again film-making is defined as a performance whereby film-makers demonstrate both the working of nature and their capacity to control it (Morus, 2006). The general tone of humorous self-deprecation can be interpreted as a display of modesty. It would make audiences feel that they can freely withhold their assent, which would form the basis of their eventual agreement that the artifice of film-making is not intended to deceive, but creates the possibility of knowing (Shapin, 1994). This tone of casual humour could also suggest film-makers' self-confidence with the fact that the question of artifice in film-making is no longer controversial, and by the mid-eighties can be taken lightly. This self-assurance translated with the next MOD, *Once More into the Termite Mound* (BBC, 1990) into the introduction of a new theme, that of the relationship between film-makers and field scientists.

3.2 Film-making as a participation in science

Produced alongside the third Attenborough series *The Trials of Life* (BBC, 1990), *Once More into the Termite Mound* dispenses with the depiction of the technicalities of film-making. Instead it is entirely focused on the work of the scientists who advised on the series. According to Peter Jones, executive producer for *The Trials of Life*, the series relied much more on scientific advisors to find stories and get ideas about what to go and film in the field,

than previous programmes did. The MOD was intended as an acknowledgement of these contributions.¹⁵ This is a pretty straightforward story. However, in 1990 participation by scientists in natural history programme-making was not a novelty. Approximately 500 contributed to *Life on Earth* (Parsons, 1982). And in 1962 Desmond Hawkins, founder of the NHU, noted: 'We look to them [scientists] as contributors, as source material, as consultants and as elite opinion on our efforts. In short we need their goodwill' (Hawkins, 1962, 7). Yet, all this time the contributions of scientists were only acknowledged with a line in the credits. Perhaps the topic of *The Trials of Life*, animal behaviour, could explain this sudden focus on scientists' work in relation to film-making.

According to its producer, the series was intended to acknowledge the development, in the 1970s-1980s, of behavioural ecology, whose main method of investigation relies on the recognition of individual animals.¹⁶ But reliance on individual animals had been natural history film-makers' stock in trade since the first decades of 20th century. All of them, from Cherry Kearton to David Attenborough through to Armand and Michaela Denis, had presented named individual animals to support their claims to cognitive legitimacy (Gouyon, 2011a). This is not to mention camera techniques such as the close-up shot which isolates individuals and creates subjects with whom viewers can engage emotionally (Bousé, 2003). As Gregg Mitman (2006) demonstrates, behavioural ecologists were especially influenced by such techniques when they started thinking in terms of individuals rather than populations. When depicting scientists' contributions, this MOD

demonstrates that scientists and film-makers share a similar approach to animals, and collaborate in the same enterprise of knowledge production.

Once More into the Termite Mound is a succession of interviews conducted by David Attenborough, interspersed with footage from the series. All interviewees are researchers, except for the last one, a wildlife cameraman. Interviews with scientists take their workplace, where they produce knowledge, and show Attenborough engaged in a conversation between equals with them, discussing emotional involvement with animals and the virtues of individualising them for understanding their behaviour. The knowledge thus obtained is said to prevent anthropomorphism, identified as the main pitfall of this approach. Discussing the 'danger' of anthropomorphising elephants, once they have been individualised and named, pachyderm expert Cynthia Moss explains that the more she learns about individual elephants, the more difficult it becomes to think of them as human or as possessing human attributes. In a nutshell, these interviews demonstrate that scientists recognise individualisation and emotional involvement, long criticised as the most un-scientific features of wildlife films, to be epistemically appropriate and heuristically fruitful. Film-makers and scientists thus appear as sharing common epistemic ground.

This is not to say that they overlap. As the final interview with wildlife cameraman Paul Atkins makes clear, field science and film-making are complementary. In this interview shot in a cutting room, Attenborough exits the frame and remains silent, interjecting punctually with exclamations of awe. Atkins explains how he shot the sequence showing killer whales

snatching seal pups on a Patagonian beach, and his relationship with his scientific advisor. The story ends with both men getting in the water to film an orca up-close. The cameraman tells of the scientist being transfixed by wonder at having seen one of 'his' animals up-close in its element:

And he was just exhilarated at having finally seen his whale underwater. That was Mel, a male that he's watched for seventeen years, just watching the back and the dorsal fin and bursting out of the water to feed, but he had never been that close to the animal. (BBC, 1990)

This last interview frames film-making as a practice that enriches participating scientists' experience. From this perspective it is more than just the communication of scientists' work, but a genuine participation in the scientific enterprise. The history of the wildlife MOD between 1963 and 1990 thus shows how wildlife film-making was fashioned as a participation in science, principally as a technology of visualisation.

Now, to briefly move away from the specific case of the wildlife MOD genre to consider the relation between science and film more broadly, it is clear that visualisation is not the only aspect of film-making accounting for its contribution in the production of knowledge. For example, a science documentary will contribute to creating networks between researchers in different disciplinary fields, leading to new understandings.¹⁷ Or research can be commissioned as part of a film project, as was the case with *Wanted: Butch Cassidy and the Sundance Kid* (Windfall, 1993). The documentary initially commissioned for the American science programme NOVA, followed an anthropologist and a forensic scientist looking for the remains of the two

legendary outlaws (Dugan, 2015). As David Dugan put it: 'the film launched the expedition and subsequent scientific investigation, and the entire venture was paid for by NOVA'.¹⁸

4. Conclusion

This article shows the evolution of the relationship between film and science across the 20th century, from a technique of visualisation controlled by scientists and subordinate to science, to being appropriated by non-scientists and becoming an equal partner in the production of knowledge. The reason why this evolution could happen in the first place is that there is more to knowledge production than scientists' work. In particular, the communication of this work, which makes it part of culture and society, is essential to the process. The historical approach adopted in this essay shows the value of history for our understanding of the relationship between science and the media, which come out as two deeply contingent categories, the results of protracted negotiations, and whose relationship is more complex than first meets the eye.

As an essay review, this article was as much intended to offer a reading of recent literature in the field as it was meant to identify avenues for further research on science and film. Comparison is the first one. Comparing media would enable us to distinguish between medium-specific aspects of the presentation of science and technology and features pertaining to the cultural space in which such presentation occurs. But comparison can also relate to the geography of our knowledge. Alongside Britain, other European

countries are well represented when it comes to early cinema, especially France and Germany, and to some extent Spain and Italy. However, as soon as the television era begins, scholarship is dominated by the British case. Further research needs to widen the scope to the whole of Europe, but also to the non-Western world. Articles like Marko Dumančić's (2012) on the participation of representations of science and scientists in 1960s Russian cinema in the politics of the Khrushchev era, or Matthew D. Johnson's (2011) on the role and place of film-making in relation to science mass education in the Maoist political project in China, can show the way. Investigating other geographical contexts should allow for comparison, not only between nations but also between larger geographical entities.

Audiences are a second area for further research. There is some literature on science film and audiences, but it is almost exclusively concerned with the contemporary period, mostly preoccupied with the technologically deterministic hypodermic effect(s) of science films and television on audiences' understandings of science and technology, and in some cases this literature operates according to a rather essentialist view of science. There does not seem to be much on 'audiencing' as an active practice, historically situated, whereby viewers relate their knowledge to what they encounter on screen, assimilating it to construct meanings (Silverstone, 2005). If the literature on science in public has taught us one thing, it is that what counts as science, and scientific practice, expertise, public, is constantly negotiated and renegotiated, to produce what we call the public culture of science. Film and television, like other media, are both a reflection of, and a contribution

to, changes in culture. If we are to understand how they contribute to shape this public culture of science, we need to look at them on their own terms, regarding the production, circulation, and consumption of their contents.

NOTES:

¹ *Chimpanzee* (2012). Directed by Alastair Fothergill and Mark Linfield.

² Quoted in *The Observer*, 21 April 2013, 'Oscar the chimp to delight UK cinema-goers'. Accessible online <<http://www.guardian.co.uk/film/2013/apr/21/chimpanzee-chimp-disney-film-oscar>>.

³ For a similar line of reasoning in relation to news media see Lehmkuhl et al. (2012).

⁴ Kirby (2011) offers a comprehensive view of the case of fiction films.

⁵ Oliver Gaycken (2011) suggests the category of "education" as a means of thinking across the divide between professional and public scientific cultures of moving-images.

⁶ The existing scholarly literature does not provide elements related to cine-scientists outside of Europe.

⁷ For an analysis of this circuit in the London context, see McKernan (2007).

⁸ Catalogue *Pathé-Doin*, nr. 3031 (Garandeanu, 2012: 94).

⁹ See Tania Munz, 2011, 'All Movements on Film! Konrad Lorenz and the Film Encyclopedia', paper delivered at the Science/Film Symposium, Northwestern University, April 2011.

¹⁰ See for instance the 'Summary of films viewed in the Natural History Unit, November 1960-March 1961', BBC WAC WE17/2/1.

¹¹ See correspondence in BBC WAC T32/635/1.

¹² *The Observer*, 'National Nature Week Planned', 4 June 1961, p.8.

¹³ See for example the *Proceedings and Transactions of The South London Entomological and Natural History Society*, 1966 (part 3 – September), p.89.

¹⁴ See the papers in BBC WAC WE17/53/1.

¹⁵ Interview with Peter Jones, 01.12.2014.

¹⁶ Interview with Peter Jones, 01.12.2014.

¹⁷ See the clip from Deborah Cadbury's oral history interview on

<http://www.bbc.co.uk/historyofthebbc/resources/horizon50/deborah-cadbury> (accessed May 2015).

¹⁸ David Dugan, personal communication.

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