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Advocacy in the tail: Exploring the implications of ‘climategate’ for science journalism and public debate in the digital age

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Abstract

This paper explores the evolving practices of science journalism and public debate in the digital age. The vehicle for this study is the release of digitally stored email correspondence, data and documents from the Climatic Research Unit at the University of East Anglia in the weeks immediately prior to the United Nations Copenhagen Summit (COP-15) in December 2009. Described using the journalistic shorthand of ‘climategate’, and initially promoted through socio-technical networks of bloggers, this episode became a global news story and the subject of several formal reviews. ‘Climategate’ illustrates that media literate critics of anthropogenic explanations of climate change used digital tools to support their cause, making visible selected, newsworthy aspects of scientific information and the practices of scientists. In conclusion, I argue that ‘climategate’ may have profound implications for the production and distribution of science news, and how climate science is represented and debated in the digitally-mediated public sphere.

Key words

News media, science journalism, digital age, climate science, blogging, fourth estate, consensus and controversy, openness and transparency, scientific governance

Introduction

Developments in digital technologies, combined with emergent scholarly (Borgman, 2007) and journalistic practices (Allan, 2009; 2006; Trench, 2007), have resulted in a disruptive period of continuity and change in the ways that scientific information (and

other forms of knowledge) circulate in the public sphere (Holliman, 2010a/b).

Concomitantly, the adept promotion of hardware and software has resulted in the fetishization of 'must-have' consumer products. In turn, this has helped to mainstream digital forms of communication and social networking, resulting in debates about the skewed distribution of user-generated contributions and whether novel forms of collective action are emerging (Shirky, 2008). Given the now widespread enthusiasm for digital technologies and the embedding of complementary social practices it is perhaps not surprising that professional news media have experienced a period of unprecedented change during the last 15 years. News media have also been challenged, not least in terms of the political economy of their underlying business models. Such challenges are ongoing, with potentially significant repercussions for diversity in the commercial news media marketplace, and, more indirectly, for public service broadcasting. Similarly, commercial newsrooms have been affected by the increased casualization of editorial staff (Deuze and Marjoribanks, 2009) and the long-term decline in investigative journalism (Davies, 2008). Meanwhile, legislation and regulatory bodiesⁱ have established governance structures to address some aspects of the UK's digitally-mediated public sphere, whilst specific support for scientists and scientific institutions in producing 'media-friendly' information subsidies (Gandy, 1982) has also been introducedⁱⁱ.

The 'digital turn' is affecting all forms of scholarship (Borgman, 2007), journalism and aspects of citizenship as we move further into a '...21st century media environment which is to an unprecedented degree networked, globalized and participatory' (McNair, 2009: 348). This wider context is particularly significant for the episode that became known as 'climategate': the release of digitally stored email correspondence, data and documents relating to climate science (Holliman, 2011, in press). Initially discussed and

promoted via the 'fifth estate' blogosphere, involving advocates and non-governmental organisations (NGOs) critical of anthropogenic explanations for climate change (Pearce, 2010; Nerlich, 2010), this unofficial release of digitally-stored information was at the very heart of what quickly became a globally newsworthy story across 'fourth estate' news media outlets (Pearce, 2010).

In this paper I explore how, when and why 'climategate' became science news and consider whether this episode, and the ways in which various actors used online communication, has wider implications for science journalism and public debate in the digital age. In addressing these issues I explore the publication of emails, data and documents from the Climatic Research Unit at the University of East Anglia in November 2009, just prior to the start of the United Nations Copenhagen Summit (also known as COP-15). I will describe 'climategate' as a scientific and political news story that explored the validity and reliability of symbolically significant aspects of climate science, such as the assessment reports of the Intergovernmental Panel on Climate Change (e.g. IPCC, 2007).ⁱⁱⁱ I argue that established practices of scientific publication were opened up to scrutiny by socio-technical networks (Kling, *et al.*, 2003) of advocates who used scientific rhetoric and sophisticated communication strategies in an attempt to challenge the credibility of high-profile climate scientists, disrupt the scientific consensus of anthropogenic climate change, and derail attempts to establish a political consensus to address this issue (Holliman, 2011, in press). This helped to create the conditions where 'climategate' became newsworthy and subjected to public debate, initially via the blogosphere, but also through interactive media provided by digital news outlets. In conclusion, I argue that 'climategate' may have profound implications for science journalism and public debates about the sciences with implications for conceptions of openness, transparency, public engagement and scientific citizenship.

The timing of 'climategate' in relation to COP-15

COP-15, where COP stands for Conference of the Parties, was the 15th meeting of the parties to the United Nations Framework Convention on Climate Change and the fifth meeting since the negotiation of the Kyoto Protocol. Held in Copenhagen, Denmark from 7th -18th December 2009, COP-15 provided an important focus of activity for anyone with an interest in climate change, including those who supported anthropogenic explanations for this phenomenon and those who did not. To this end the summit involved official delegations from 192 countries, charged with the production of a political agreement to reduce emissions of greenhouse gases, lower energy demands, and mitigate the worst effects of climate change. COP-15 also included delegations from NGOs, charities and industry, arguing from a range of positions with respect to anthropogenic explanations for climate change.

COP-15 was a global news event. News organizations from various countries were sensitized to what this event could represent, and prepared for it. This is evidenced by more than 5000 advance applications for official media accreditation from 180 countries—from newspapers and broadcasters, but also charities, NGOs, pressure groups and industry—so many that applications were closed prior to the event (Vidal, 2009). Clearly access to COP-15 via the route of media accreditation was valued, and not just by mainstream news media outlets. Preparations within newsrooms also began in advance of COP-15. This is illustrated by some of the coverage published on 7 December 2009, the first day of COP-15.^{iv} For example, 56 newspapers published an unprecedented collaboratively authored editorial in 20 languages, and in 45 different countries (Editorial, 2009). Instigated in the UK by the Deputy Editor of *The Guardian* (Katz, 2009), and licensed during COP-15 under Creative Commons, this editorial called for political action to tackle the effects of climate change (Editorial, 2009). The online

version, published in the UK on 6 December 2009, invited readers to respond in two ways: directly to the editorial with comments; or to write their own editorial on the environment blog on *guardian.co.uk*.^v Between 6 and 11 December 2009 over 1,000 comments had been posted by readers, with a further 78 contributions as 'reader leaders' on the environment blog.^{vi} Taken together the editorial and the opportunity for readers to contribute illustrate both the potential and limitations of the web as a space for public debate. Whilst digital technologies may engender collaboration and collective action, they can also foster disagreement (Shirky, 2008).^{vii} Indeed, many of the reader comments demonstrate the polarized and sometimes ideologically-driven nature of debates about climate change, as the following extracts from the 'reader leaders' show:

'Well done Guardian for showing leadership on this.

Of course there are still sad boys (mainly on talk boards) pitching the idea that the majority of the world's climate scientists are all part of some communist plot. But it's cheering to notice that despite all their misinformation, more than 60% of the UK population now acknowledge the evidence.

We're beginning to see the coming together of the mature and responsible across political divides to make this work. The Times produced a 'sceptics guide to global warming' the other day, which made it perfectly plain that they also regard a head-in-sand approach as dangerously unsustainable. Lets [sic] hope this gathering sense of urgency from many quarters gives the politicians the courage they need, at Copenhagen or soon after, to deal with this emergency.' (Landice, posted 2009, December 6: 9.02pm)

In many ways the comment from Landice echoes the sentiment of the collaborative editorial. Whilst acknowledging the challenges to the credibility of some climate

scientists, it is a call to political action to mitigate the worst effects of climate change.

The following comment, which was posted within an hour of the example above, argues from a radically different perspective. In so doing, it contests some of the methodologies and evidence for an anthropogenic explanation for climate change, processes of verification—peer review—and attempts to discredit the scientists who produced it.^{viii}

‘The only acceptable agreement from Copenhagen [is to] do nothing at this time.

The models on which the alarm is based don't work properly (how can they?

There are too many unknown variables, and they build their case very narrowly). In any case the range of prediction is absurdly wide.

The scientists leading the field no-longer have any credibility.

The temperature record data is a shambles and is cynically manipulated to accord with the accepted group-think.

The data used for the proxy reconstructions is cherry picked to fit the case being made. [...]

The "peer review" process is revealed as a sick group-think joke.

In due course when this madness is unpicked, the principle [sic] players, including the politicians, journalists and main scientists promoting this nonsense, must be made to pay.’ (PeteDun, posted 2009, December 6: 10.12pm)

These illustrative comments demonstrate some of the ways that readers can contribute to, and help to shape, news reporting in the digital age. Audiences consuming online news can now provide direct and indirect feedback on science reporting: by commenting directly on online articles where this function is available or contacting journalists by

email; or indirectly via blogs and other forms of social networking (Allan, 2009; Priest, 2009). In this respect the interactivity that online news affords serves to disrupt, at least to some degree, the dominant linearity of pre-digital media in structuring flows of information from producers to receivers (Thompson, 1999). However, this does not equate to a complete democratisation of the flow of news between producers and receivers, where the power to select and frame news still resides largely within newsrooms (Habermas, 2006), but it does redress the balance somewhat. In a similar vein, these examples also demonstrate the increasing significance of online news outlets as sites where citizens, scientists, journalists and other stakeholders can engage in debate about the sciences and science-related issues (Allan, 2009; Holliman, 2008). But, as Trench (2011, in press) has cautioned, it is over-optimistic to assume that the digitally-mediated public sphere will become a space 'in which public opinion can be formed through rational discussion'.

Making 'climategate' news

Scientists working at the Climatic Research Unit at the University of East Anglia were used to receiving formal requests for information from scientists, NGOs and citizens, including several in July 2009 under the terms of the UK's Freedom of Information Act (House of Commons Science and Technology Committee, 2010).^{ix} Following these requests, in Autumn 2009, a back-up server at the Climatic Research Unit at the University of East Anglia, UK was accessed, possibly up to three times and over the course of a number of weeks (Pearce, 2010). It is still (March 2011) unclear who accessed this server, why, with what support, or whether the emails, data and documents were hacked, leaked—and therefore whether a crime was committed—or simply accessed from an unsecured location (Ibid.). However, this operation does appear to have involved sophisticated procedures, resulting in the online publication of a

largely untraceable collection of selected emails, data and documents (Ibid.), timed to coincide with the preparations for COP-15.

Over 160Mb of data was copied without the formal permission of the Climatic Research Unit or the University of East Anglia. The data consisted of over 1,000 emails (dating from 1996 to 12 November 2009) and more than 3,000 documents, some of which date back to 1991 (House of Commons Science and Technology Committee, 2010; Pearce, 2010). The information had been produced primarily by scientific researchers working at the Climatic Research Unit. This communication was private. It had not been produced for dissemination in the public sphere. Rather, it was produced and circulated among scientists and peers during research activities and the preparation of scientific manuscripts for publication in peer reviewed academic journals and other reports, including the assessment reports produced by the IPCC. In effect, digitally-stored private communication produced by several university-based climate scientists was made public, but without the knowledge or permission of the scientists involved or their institutions.

A small number of bloggers on the west coast of the US—critics of anthropogenic explanations for climate change—appear to have been the first to publish emails from the released information (Pearce, 2010; Nerlich, 2010). This followed a comment, posted anonymously, on the Air Vent blog (Holliman, 2011 in press; Trench, 2011, in press).^x Bloggers selected newsworthy information from the emails, data and documents in order to influence the news agenda, disrupt scientific explanations for anthropogenic climate change, and derail calls for political action in the run-up to COP-15:

‘The bloggers who first alerted the world to the presence of the liberated files [...] were already spinning them as a smoking gun that revealed a global conspiracy by scientists to dupe the world about man-made climate change. The bloggers, who mostly ran websites trashing mainstream climate science,

had their quotes from the emails ready. And the interpretations. They knew that, as in most breaking news stories, whoever grabs the agenda first has a home run. Every subsequent story has refracted those initial impressions.'

(Ibid: 4)

In addition to these initial blog posts a sample of the released information was also published on 17 November 2009 on a website called 'RealClimate'. This was done from a remote location using an 'open proxy' to hide the person's identity (Ibid.). This upload was completed without the permission of the owners of that site, which is not surprising given that RealClimate is generally supportive of anthropogenic explanations for climate change (Ibid.). Although the material was swiftly removed from the RealClimate site (Ibid.) by this point it was already circulating in the blogosphere (Nerlich, 2010; Pearce, 2010) and on related websites (Pearce, 2010), including those hosted by NGOs with established reputations for criticizing anthropogenic explanations of climate change and attempts to mobilize political action to address these issues. How then might we understand the role of social media in publicizing this release of information and making 'climategate' news?

Shirky (2008) discusses the now infamous 'power law distribution' that is associated with user-generated content and social media, such as blogs. In effect, he argues that there can only be a very small number of bloggers with large audiences. The vast majority of bloggers—'the long tail'—will have very small audiences. Linked to this he also argues that 'Small World networks [can act] as a natural amplifier of news' helping to filter and redistribute information (Ibid: 298). If we apply these ideas to the example of 'climategate' it is possible to argue that a small number of bloggers, in combination with websites of certain NGOs, all of whom were critical of anthropogenic explanations for climate change, helped to filter and select newsworthy information from the released

emails, data and documents, and redistribute this in the digitally-mediated public sphere. This distributed collective action ensured that sufficient numbers of readers who were sympathetic to this critical position were mobilized to further redistribute the information among other bloggers and websites with smaller audiences, and so on well into the long tail. In so doing, the actions of these actors served to amplify this story (Trench, 2011, in press) while the selected information served as sources of science news, not least for journalists who were already sensitized to the scientific and political arguments that were due to be discussed at COP-15 (Nerlich, 2010). In effect, the actions of a small number of bloggers and NGOs, at least some of whom were ideological driven to do so, helped to shape the news agenda and public debate about climate change around the time of COP-15.

The significance of ‘-gate’ frames

Notwithstanding the important role that bloggers and NGOs played in filtering and redistributing emails, data and documents from the Climatic Research Unit, thereby providing an initial framing of this episode, news reports were also significant in bringing this episode to a wider audience. Indeed, news media continue to hold particular significance in terms of framing how the sciences are represented in the public sphere (Nisbet and Scheufele, 2009). This is important because science news retains the potential to perform what Gieryn (1995) describes as ‘boundary work’, defining: what does (and does not) count as reliable and valid knowledge; whether a scientific consensus exists; what is controversial; who is a credible expert (and who is not); and, to some extent at least, when and why readers should be concerned about a science-based issue. As Habermas (2006: 415, emphasis in original) argues:

[...] the *dynamics* of mass communication are driven by the power of the media to select, and shape the presentation of, messages and by the

strategic use of political and social power to influence the agendas as well as the triggering and framing of public issues.’

The power of news media to partly frame the terms of debate for a given topic has the related function of simplifying what can be complex issues. This has relevance for the reporting of this episode, because of the connotations of the ‘–gate’ framing. As the following examples illustrate, early UK newspaper reports emphasized the role of sceptic hackers in revealing evidence of manipulation and/or leaking information to expose collusion, but they did not use the ‘climategate’ descriptor.^{xi}

‘Hackers “expose global warming con”: sceptics claim that leaked emails reveal research centre massaged temperature data’ (Macrae, 2009)

and

‘Climate sceptics claim leaked emails are evidence of collusion among scientists

Hundreds of emails and documents exchanged between world's leading climate scientists stolen by hackers and leaked online’ (Hickman and Randerson, 2009)

It was not long, however, before the term ‘climategate’ was circulating in the public sphere in the US (Whitell, 2009). It was also used by well-known ‘sceptics’,^{xii} including journalists writing on blogs (Booker, 2009), and in newspaper reports:

‘Who’s to blame for ‘Climategate’? The global fall-out from damning emails about climate change is gathering momentum’ (Rayner, 2009)

In utilizing the –gate suffix as shorthand for this episode bloggers and journalists simplified the terms of the debate, generating meaning by making indirect reference to the impeachment of the US President Richard Nixon in the 1970s following a break-in at

the Watergate office complex. Taken in this light 'climategate' infers the identification of wrongdoing, suppression of evidence, and the exposure of manipulation via investigative journalism.^{xiii} Of course, in this instance the investigative journalists were initially the critics of anthropogenic climate change and the as yet unidentified actor(s) who released the data from the Climatic Research Unit. Professional journalists working for news media outlets then had to play catch-up.

Some implications for science journalism and public debate about the sciences

Three UK-based reviews were instigated to assess the claims made against the Climatic Research Unit and the University of East Anglia (Oxburgh, *et al.*, 2010; Russell, *et al.* 2010; House of Commons Science and Technology Committee, 2010).^{xiv} All three reviews cleared the scientists based at the Climatic Research Unit of any serious wrongdoing or academic malpractice in the ways that they conducted their scientific research. The reports also make a series of recommendations. Those most relevant to the reporting of climate science include the encouragement that all scientists work with media and communications professionals to communicate their research, with specific reference being made to the Science Media Centre (Russell, *et al.* 2010). Furthermore, requests were made for greater clarification about the extent to which Freedom of Information legislation applies to academic research (*Ibid.*). Recommendations were also made for greater openness and transparency in relation to the communication of climate science data, computer codes and interpretations (House of Commons Science and Technology Committee, 2010). Similarly, it was argued that systems should be developed where responsibility for the archiving and curation of research data are clear (Russell, *et al.* 2010).

Given these related recommendations, it is somewhat ironic that there is currently more scientific information—as raw data, information and formalised knowledge—circulating in

the public sphere than ever before (Montgomery, 2009). In part, this is because there are more scientists working as researchers than ever before, but it is also because of changing professional practices. Scientific information is now routinely stored, shared, archived and retrieved over digital networks (Holliman, 2010b). However, public access to the sciences remains uneven. Certain fields of scientific inquiry have enthusiastically and proactively embraced the mantra of openness and transparency by publishing raw data on the web, promoting open access publication, and exploring methods of open review (Wager, 2009). The sharing of data among scientific experts is commonplace in certain fields where 'digital scholars' are the norm (Borgman, 2007), ideas about 'collaboratories' (Wulf, 1993) have been realised, open notebooks are available online, and enthusiastic 'pro-ams' (Leadbetter and Miller, 2004) are, on occasion, encouraged to contribute to the collection and assessment of data (e.g., see Borgman, *et al.*, 2008).^{xv}

Other fields, however, have been more cautious in extending their scholarly practices to promote openness in the use of digital forms (Chalmers, 2009; Schofield, *et al.*, 2009). In part these concerns are associated with the sharing of intellectual property (Schulze, 2009) and the wider shift towards 'post-academic science' within some scientific fields (Ziman, 2000). But resistance to change may also result from support for well established norms and conventions of knowledge verification, such as anonymous peer review (Wager, 2009; Editorial, 2006). In other fields, however, where scientific knowledge has become overtly politicised and challenges to scientific interpretations have a long history, such as climate science (Oreskes and Conway, 2010), scientists may be less willing to proactively release raw data, computer codes and related information for fear of how it might be used.^{xvi} The danger of such a strategy, of course, is that activists can seek to have data released, for example via freedom of information requests, hacks or leaks, whilst at the same time criticising what they perceive to be the

secrecy of the scientists involved. As the 'climategate' episode illustrates, this can have important implications for science journalism and public debate, as journalists and citizens use scientific, media and information literacy skills to access, assess, analyse and respond to publicly available data. In so doing, they seek to interpret, contextualise and, at times, respond to and shape developments with areas of frontier science that are significant to them.

Engaging via the digitally-mediated public sphere

'Climategate' ensured that scientific knowledge about climate science is more visible in the digitally-mediated public sphere. To some extent so are the practices of knowledge production in this interdisciplinary field of scientific inquiry (Ryghaug and Skjølsvold, 2010). In this sense, the lid may have been raised a little on what Latour (1987) described metaphorically as the black box of scientific knowledge production.

'Climategate' has both contributed to, and reflected on, this wider context with significant implications for science journalism and public debate about the sciences. However, it is also important to note that the shift towards greater openness and transparency is, at least in part, also the result of a wider trend in scientific governance, resulting from failures to effectively communicate scientific risk and uncertainty, and to effectively manage episodes such as BSE and variant CJD (Irwin, 2009) and commercially-grown genetically-modified crops (Heller, 2003). These changes can be characterised by a shift from ideas about 'public understanding' towards more sophisticated conceptualisations of the practices of science communication and governance (Irwin, 2009). In this more recent conceptualisation, dialogic and contextual approaches are valued under the banner of upstream public engagement with the techno—sciences (Irwin, 2008). Notwithstanding concerns about the extent to which conceptualisations of public engagement have become embedded in the routine practices of some scientists,

scientific institutions and government policy making (e.g., see Holliman and Jensen, 2009; Irwin, 2006), it is possible to document examples where non-scientists have contributed to public debates about the sciences, and at least some of these involve online consultations, discussions and debates (King and Webster, 2009; Stilgoe, 2007; Heller, 2003; Wood, *et al.*, 2003). In this light I argue that 'climategate' is an example of an unofficial and largely unstructured form of public engagement; one where critics of anthropogenic explanations of climate change assembled as socio-technical networks (Kling, *et al.* 2003) drawing on a range of skills and competencies to promote their cause, whilst scientists, politicians and other stakeholders were mobilized to respond to and repair the scientific and political consensus at the COP-15 summit.

'Climategate' also illustrates that, on a similar timescale to the 'dialogic turn' in scientific governance, additional formats (podcasts, blogs, 'reader leaders') have been introduced to online news outlets where science reporting can be published 24/7 and, at times, discussed. At the same time, news editors can assess data in real time on the types of stories that generate traffic and discussion among audiences, responding quickly to developing news agendas and trends (e.g. assessing search engine optimisation),^{xvii} and adapting their selection of stories to take account of national and international audiences. Journalism, therefore, has become more responsive to what audiences ask for, consume, respond to, debate, and often in real time. Meanwhile, the digital turn means that there is a vast wealth of web-based scientific information for journalists to navigate and filter as they select newsworthy stories (Allan, 2009; Trench, 2007; Holliman, 2007). Indeed, this has led some to argue that 'data-driven journalism' may become a more significant activity within newsrooms (Arthur, 2010). But 'climategate' also illustrates that journalists are not the only ones who can mine raw online data and generate news. Interested and motivated citizens with sufficient time and access to the web and the

requisite skills and competencies in working with scientific data and digital media can assemble as socio-technical networks (Kling, *et al.*, 2003) to generate science news and public debate. This was the case when bloggers and related NGOs did much to publicize a filtered, newsworthy selection of information from the emails, documents and data that had been released for publication on the web (Pearce, 2010; Nerlich, 2010).

Concluding thoughts

The shift towards a digital, globalised media landscape affords greater levels of interaction and participation to those with access to the web and the skills to produce, distribute, share, archive and retrieve scientific information. This includes scientists, journalists, other stakeholders, and citizens with an interest in the sciences. This developing digital landscape has the potential, as yet unrealised, to make all stages of the research process more visible in the public sphere. Digital media afford the 'fans' of science (Priest, 2009), as well as ideologically-driven advocates, a largely un-moderated space promote their causes, assemble and mobilize networks of activists, submit requests under the terms of Freedom of Information, enact forms of direct action, challenge scientific orthodoxies, and so on. Of course, advocacy and direct action are not new to the environmental sciences, or to media reporting of environmental issues, as Hansen's (1993) work illustrates. Neither are they new to the work of the IPCC and the publication of its assessment reports (Oreskes and Conway, 2010). However, 'climategate' illustrates that critics of anthropogenic explanations of climate change know how to use digital tools to support their cause, making visible selected newsworthy aspects of scientific information and the practices of scientists. It follows that scientifically literate 'fans' exist in the skewed power law distribution of social media (Shirky, 2008), but so do advocates who are motivated and dedicated to their cause, with the requisite scientific and media literacy skills to generate science news and

debate in the digitally-mediated public sphere. Those currently working on the preparation of the IPCC's Fifth Assessment Report would do well to take note.

References

- Allgaier, J. and Holliman, R. (2006) The emergence of the controversy around the theory of evolution and creationism in UK newspaper reports. *Curriculum Journal* 17(3): 263-79.
- Allan, S. (2009) Making science newsworthy: exploring the conventions of science journalism. In: Holliman, R., Whitelegg, E., Scanlon, E., Smidt, S. and Thomas, J. (eds) *Investigating science communication in the information age: Implications for public engagement and popular media*. Oxford: Oxford University Press, 149-65.
- Allan, S. (2006) *Online news – Journalism and the Internet*. Maidenhead: Open University Press.
- Arthur, C. (2010) Analysing data is the future for journalists, says Tim Berners-Lee. *guardian.co.uk: media*, November 22, URL (consulted January 2011): guardian.co.uk/media/2010/nov/22/data-analysis-tim-berners-lee
- Booker, C. (2009) This is the worst scandal of our generation. *The Sunday Telegraph*, November 29, p. 27.
- Borgman, C., Abelson, H., Dirks, L., et al. (2008) *Fostering learning in the networked world: The cyberlearning opportunity and challenge, infrastructure report*. National Science Foundation (NSF) Taskforce on Cyberlearning, URL (consulted January 2011): nsf.gov/pubs/2008/nsf08204/nsf08204.pdf
- Borgman, C. (2007) *Scholarship in the digital age: information, infrastructure and the Internet*. Cambridge, Mass: MIT.

- Chalmers, M. (2009) Communicating physics in the information age. In: Holliman, R., Thomas, J., Smidt, S., Scanlon, E., and Whitelegg, E. (eds) *Practising science communication in the information age: Theorising professional practices*. Oxford: Oxford University Press, 67-80.
- Davies, N. (2008) *Flat-Earth news*. London: Chatto and Windus.
- Deuze, M. and Marjoribanks, T. (2009) Newswork. *Journalism: Theory, Practice and Criticism* **10**(5): 555-61.
- Editorial (2009) Fourteen days to seal history's judgment on this generation. *guardian.co.uk*, December 7, URL (consulted January 2011): guardian.co.uk/commentisfree/2009/dec/06/copenhagen-editorial
- Editorial (2006) Peer review and fraud: Two assessments of the refereeing process highlight challenges for journals. *Nature* **444**: 971-2.
- Gandy Jnr., O. (1982) *Beyond agenda setting: Information subsidies and public policy*. Norwood, New Jersey: Ablex.
- Gieryn, T. (1995) Boundaries of science. In: Jasanoff, S., Markle, G., Petersen, J. and T. Pinch (eds) *Handbook of science and technology studies*. Thousand Oaks, CA: Sage, 393-443.
- Glaister, D. (2005) LA Times 'wikitorial' gives editors red faces. *guardian.co.uk: technology*, June 22, URL (consulted January 2011): guardian.co.uk/international/story/0,,1511745,00.html
- Gleick, P., et al. (2010) Climate change and the integrity of science. *Science* **328**: 689-70.

- Habermas, J. (2006) Political communication in media society: Does democracy still enjoy an epistemic dimension? The impact of normative theory on empirical research. *Communication Theory* 16: 411-26.
- Hansen, A. (Ed.). (1993) *The mass media and environmental issues*. Leicester: Leicester University Press.
- Heller, R. (2003) *GM Nation? The findings of the public debate*. Department of Trade and Industry. London: HMSO.
- Hickman, L. and Randerson, J. (2009) Climate sceptics claim leaked emails are evidence of collusion among scientists. *guardian.co.uk: environment*, November 21, URL (consulted January 2011):
guardian.co.uk/environment/2009/nov/20/climate-sceptics-hackers-leaked-emails
- Holliman, R. (2011, in press) The struggle for scientific consensus: communicating climate science around COP-15. In: Wagoner, B., Jensen, E. and J. Oldmeadow (eds) *Culture and social change: Transforming society through the power of ideas*. Charlotte, NC: Information Age Publishers.
- Holliman, R. (2010a) From analogue to digital scholarship: implications for science communication researchers. *Jcom* 09(03) C05, URL (consulted January 2011):
oro.open.ac.uk/23218
- Holliman, R. (2010b) Online media and the sciences. In: Priest, S. *et al.* (eds) *Encyclopedia of Science and Technology Communication*. Thousand Oaks, California: Sage, 546-51, URL (consulted January 2011): oro.open.ac.uk/23119
- Holliman, R. and Jensen, E. (2009) (In)authentic science and (im)partial publics: (re)constructing the science outreach and public engagement agenda. In: Holliman, R., Whitelegg, E., Scanlon, E., *et al.*, *op cit*, 32-52.

Holliman, R. (2008) Communicating science in the digital age - issues and prospects for public engagement. In: MacLennan, J (ed.) *Readings for technical writers*. Toronto, Canada: Oxford University Press, 68-76.

Holliman, R. (2007) Reporting environmental news: the evolving context for newspapers in the digital age. *Frontiers in Ecology and the Environment* 5(5): 277-8.

Holliman, R. and Scanlon, E. (2006) Investigating co-operation and collaboration in near synchronous computer mediated conferences. *Computers & Education* 46(3): 322-35.

House of Commons Science and Technology Committee (2011) *The Reviews into the University of East Anglia's Climatic Research Unit's E-mails*. (First Report of Session 2010-11). London: HMSO.

House of Commons Science and Technology Committee (2010) *The disclosure of climate data from the Climatic Research Unit of the University of East Anglia* (Eighth Report of Session 2009-10). London: HMSO.

InterAcademy Council (2010) *Climate change assessments: Review of the processes and procedures of the IPCC*. Amsterdam: InterAcademy Council.

IPCC (2007) *Climate Change 2007: Synthesis Report*. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds)]. IPCC, Geneva, Switzerland, URL (consulted January 2011):

ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

- Irwin, A. (2009) Moving forwards or in circles? Science communication and scientific governance in an age of innovation. In: R. Holliman, Whitelegg, E., Scanlon, E., op cit, 3-17.
- Irwin, A. (2008) Risk, science and public communication: third order thinking about scientific culture. In: M. Bucchi and B. Trench (eds) *Public communication of science and technology handbook*. London: Routledge, 199-212.
- Irwin, A. (2006) The politics of talk: Coming to terms with the 'new' scientific governance. *Social Studies of Science* **36**(2): 299-320.
- Jenkins, E. (2006) School science and citizenship: whose science and whose citizenship? *The Curriculum Journal* **17**(3): 197-211.
- Katz, I. (2009) How the climate change global editorial project came about. *guardian.co.uk: environment*, December 6, URL (consulted January 2011): guardian.co.uk/environment/2009/dec/06/climate-change-leader-editorial
- King, S. and Webster, T. (2009) *Synthetic biology: Public dialogue on synthetic biology*. London: Royal Academy of Engineering.
- Kling, R. McKim, G. and King, A. (2003) A bit more to it: Scholarly communication forums as socio-technical interaction networks. *Journal for the American Society for Information Science and Technology* **54**(1): 47-67.
- Landice (posted 2009, December 6: 9.02pm) Your 'reader leaders' on Copenhagen. Hosted at *guardian.co.uk: environment blog*, URL (consulted January 2011): guardian.co.uk/environment/blog/2009/dec/02/reader-leaders-copenhagen
- Latour, B. (1987) *Science in action: How to follow scientists and engineers through society*. Open University Press, Milton Keynes.

- Leadbetter, C. and Miller, P. (2004) *The pro-am revolution: How enthusiasts are changing our economy and society*. London: Demos.
- Macrae, F. (2009) Hackers 'expose global warming con': sceptics claim that leaked emails reveal research centre massaged temperature data. *Daily Mail*, November 21, URL (consulted January 2011): dailymail.co.uk/news/article-1229740/Hackers-expose-global-warming-Claims-leaked-emails-reveal-research-centre-massaged-temperature-data.html
- McNair, B. (2009) Journalism in the 21st Century – evolution, not extinction. *Journalism: Theory, Practice and Criticism* 10(3): 347-9.
- Montford, A. (2010) *The climategate inquiries*. London: Global Warming Policy Foundation.
- Montgomery, S. (2009) Science and the online world: realities and issues for discussion. In: Holliman, R., Thomas, J., Smidt, S., *op cit*, 83-97.
- Nerlich, B. (2010) 'Climategate': Paradoxical metaphors and political paralysis. *Environmental Values* 19: 419-42.
- Nisbet, M. and Scheufele, D. (2009) What's next for science communication? Promising directions and lingering distractions. *American Journal of Botany* 96: 1767-78.
- Oreskes, N. and Conway, E. (2010) *Merchants of doubt: How a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. New York: Bloomsbury Press.
- Oxburgh, R., Davies, H., Emanuel, K., Graumlich, L., Hand, D., Huppert, H. and Kelly, M. (2010) Report of the International Panel set up by the University of East Anglia to examine the research of the Climatic Research Unit, URL (consulted January 2011): uea.ac.uk/mac/comm/media/press/CRUstatements/SAP

- Pearce, F. (2010) *The climate files: The battle for the truth about global warming*.
London: Guardian Books.
- PeteDun (posted 2009, December 6: 10.12pm) Your 'reader leaders' on Copenhagen.
Hosted at *guardian.co.uk: environment blog*, URL (consulted, January 2011):
guardian.co.uk/environment/blog/2009/dec/02/reader-leaders-copenhagen
- Priest, S. (2009) Reinterpreting the audiences for media messages about science. In:
Holliman, R. Whitelegg, E. and Scanlon, E. *et al.*, *op cit*, 223-36.
- Rayner, G. (2009) Who's to blame for 'Climategate'? The global fall-out from damning
emails about climate change is gathering momentum. *The Daily Telegraph*,
November 28, p. 19.
- Reisch, H. (2010, in press) Changing news: re-adjusting science studies to online news.
Public Understanding of Science, URL (consulted January 2011; first published
26 August, 2010): pus.sagepub.com/content/early/recent
- Ryghaug, M. and Skjølsvold, T. (2010) The global warming of climate science:
Climategate and the construction of scientific facts. *International Studies in the
Philosophy of Science* **24**(3): 287-307.
- Russell, M., Boulton, G., Clarke, P., Eyton, D. and Norton, J. (2010) *The independent
climate change emails review*, URL (consulted January 2011): [cce-
review.org/pdf/FINAL%20REPORT.pdf](http://cce-review.org/pdf/FINAL%20REPORT.pdf)
- Schofield, P., Bubela, T., Weaver, T., Portilla, L., Brown, S., Hancock, J., Einhorn, D.,
Tocchini-Valentini, G., Hrabe de Angelis, M. and Rosenthal, N. (2009) Post-
publication sharing of data and tools. *Nature* **461**: 171-3.
- Schulze, C. (2009) Patents and the dissemination of scientific knowledge. In: Holliman,
R. Thomas, J. Smidt, S. *et al.*, *op cit*, 35-49.

- Shirky, C. (2008) *Here comes everybody: How change happens when people come together*. London: Penguin.
- Stilgoe, J. (2007) *Nanodialogues: Experiments in public engagement with science*. London: Demos.
- Thompson, J. (1999) The media and modernity. In: Mackay, H. and O'Sullivan, T. (eds) *The media reader: Continuity and transformation*. London: Sage, 13-27.
- Trench, B. (2011, in press) Scientists' blogs: glimpses behind the scenes. In: Rödder, S., Franzen, M. and P. Weingart (eds) *The sciences' media connection – Communication to the public and its repercussions*. Sociology of the Sciences Yearbook, Dordrecht: Springer.
- Trench, B. (2007) How the Internet changed science journalism. In: M. Bauer and M. Bucchi (eds) *Journalism, science and society: Science communication between news and public relations*. London: Routledge, 133-41.
- University of East Anglia (UEA) (2009a) CRU update 1. November 23, URL (consulted January 2011): uea.ac.uk/mac/comm/media/press/2009/nov/CRU-update
- University of East Anglia (UEA) (2009b) CRU update 2. November 24, URL (consulted January 2011): uea.ac.uk/mac/comm/media/press/2009/nov/CRUupdate
- Vidal, J. (2009) A perfect storm. Independent twitterers, bloggers, activists and diverse interest groups will outnumber the media at the Copenhagen summit. *guardian.co.uk: media*, December 7, URL (consulted January 2011): guardian.co.uk/media/2009/dec/07/copenhagen-summit-media-army
- Wager, E. (2009) Peer review in science journals: past, present and future. In: Holliman, R. Thomas, J. Smidt, S. *et al.*, *op cit*, 115-30.

Whitell, G. (2009) He has a mountain to climb and a gulf to bridge: Obama's big climate journey. *The Times*, November 27, p. 54-5.

Wood, S., Jones, R. and Geldart, A. (2003) *The social and economic challenges of nanotechnology*. Swindon: Economic and Social Research Council.

Wulf, W. (1993) The collaboratory opportunity. *Science* **261**: 854–5.

Ziman, J. (2000) *Real science: What it is and what it means*. Cambridge, Cambridge University Press.

ⁱ For example, Freedom of Information legislation (ico.gov.uk), the UK Office of Communications (Ofcom; ofcom.org.uk).

ⁱⁱ For example, the Science Media Centre (sciencemediacentre.org) and AlphaGalileo (alphagalileo.org).

ⁱⁱⁱ Established in 1988 the IPCC (2007) mandate is to produce policy-relevant assessment related to climate change, drawing on relevant scientific, technical and socio-economic information. The process of reviewing existing research is managed via a small secretariat, drawing on a network of authors and reviewers.

^{iv} I monitored the coverage on 7 December 2009 in 'real time', via both online and printed newspapers. This was supplemented by a search of 'UK newspapers' in the Nexis® UK electronic database between 1 November and 8 December 2009. The search terms used were: 'Copenhagen' and 'Climat*' and 'Conference', yielding 322 results.

^v *The Guardian's* approach may have been informed by a previous experiment where the *Los Angeles Times* introduced a 'wikitorial' about the then war in Iraq (Glaister, 2005). Online readers of the 'wikitorial' were invited to contribute to, or re-write, the original 1,000-word copy produced by *Los Angeles Times* journalists. Following contributions and interventions on behalf of readers, newspaper staff and an advisor to the experiment, the wikitorial was removed. This followed the posting of inappropriate material (Ibid.).

^{vi} Several contributions have been removed from the *guardian.co.uk* website, illustrating one of the challenges faced by researchers when studying online media: the transient nature of some of these forms (Reisch, 2010). This also demonstrates the significant role that moderators play in shaping online discussions, e.g. through their assessment of contributions as being compliant with often explicitly stated rules of engagement (Holliman and Scanlon, 2006).

^{vii} It is important to note that attempts to debate climate science pre-date the internet. For example, Oreskes and Conway (2010) document a campaign to discredit the lead author, Ben Santer, of the Intergovernmental Panel on Climate Change's Second Assessment Report (published in 1995). Led by a small group of physicists, this campaign involved a series of articles, letters to US congressmen, etc. (Ibid.). Santer responded with an open letter signed by 29 colleagues and received support via a further open letter authored by the American Meteorological Society (Ibid.). Open letters are often used by scientists to counter challenges to their credibility and refute questions of scientific theories. As such, they are used to maintain or repair scientific consensus (Holliman, 2011, in press; Allgaier and Holliman, 2006).

^{viii} The rhetorical strategies deployed in this example are analogous to those used by creationists and supporters of intelligent design when contesting the scientific validity and reliability of evolutionary theory (Allgaier and Holliman, 2006).

^{ix} Trench (2011, in press) argues that at least some of these requests appear to have been coordinated via the Climate Audit blog (climateaudit.org).

^x Select noconsensus.wordpress.com to access 'the Air Vent' blog.

^{xi} To explore the initial framing of this episode I searched 'UK newspapers' in the Nexis® UK electronic database between 1 November and 31 December 2009. The search terms were: 'email*' and 'climat*' and 'research', yielding 140 results.

^{xii} Although sometimes referred to as 'contrarians' or 'denialists' in public debates, news reports also use the term 'sceptic' to describe critics of anthropogenic explanations of climate change. This is often criticized by scientists who support anthropogenic explanations of climate change as they argue that they also value the norm of scepticism and are therefore sceptics too (Gleick, *et al.*, 2010). However, in a further illustration of the contested nature of public debates about climate change they themselves are sometimes described as 'warmists' or 'alarmists'.

^{xiii} However, it is also important to note that the -gate suffix has been used many times by journalists. As such, the precise meaning of the -gate suffix is contingent to the example under consideration.

^{xiv} Several further reports have followed, including reviews of the UEA-instigated inquiries (House of Commons Select Committee, 2011; Montford, 2010), a review of IPCC procedures (InterAcademy Council, 2010), and a study of the email correspondence (Ryghaug and Skjølsvold, 2010).

^{xv} These approaches tend to be described under the banner of 'citizen science'. It is important to note, therefore, that thriving communities of 'pro-am' scientists—for example, ornithologists, astronomers and geologists—pre-date the introduction of digital technologies and citizen science approaches have a long history (see Jenkins, 2006 for discussion).

^{xvi} Alternatively scientists might argue, as those at the Climatic Research Unit did via the Press Office at the University of East Anglia, that scientific data is either restricted by the licences of those who hold and/or own it (UEA, 2009a) or already available in the public sphere (UEA, 2009b). Hence, scientists do not necessarily have the rights to republish (or access) scientific data, and there is an open question about whether they should republish scientific data that are already publicly available.

^{xvii} Online newspapers now employ specialists who assess search engine optimisation on high-profile news stories. They also provide advice to journalists in how to write for the web (e.g. headlines, standfirsts and the first paragraphs of online copy).