

BBC Trust review of impartiality and accuracy of the BBC's coverage of science

July 2011

With an independent assessment by Professor Steve Jones and content research from Imperial College London

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The following appendices are available as separate PDFs on the Trust website:

Appendix A: Imperial College London research

Appendix B: Terms of Reference for the Review

Clarification

On 8 August 2011 the Trust published an updated version of Professor Steve Jones' independent review of the accuracy and impartiality of the BBC's science coverage due to an ambiguity in the section on climate change. This reference was in the section on pages 71-72, immediately before Professor Jones discussed statements about climate change contained in two BBC programmes.

The Trust and Professor Jones now recognise that the passage as originally published could be interpreted as attributing statements made in those two programmes to Lord Lawson or to Lord Monckton. Neither programme specifically featured Lord Lawson or Lord Monckton and it was not Professor Jones' intention to suggest that this was the case. Professor Jones has apologised for the lack of clarity in this section of his assessment, which has now been amended.

BBC TRUST COMMENTARY WITH CONCLUSIONS

Summary

Science plays an extremely important role in contemporary life. Scientific developments have the capacity to directly affect us all significantly. Debates relating to everything from climate change to medical advances to DNA technology feature prominently in our public discourse. And ethical, policy and funding questions associated with science arouse strong emotions. As a consequence they often strike at the core of sensitive editorial issues. So it is vital that the BBC's audience enjoys science coverage of the very highest standards.

It is for this reason that the Trust decided in 2010 to review the accuracy and impartiality of BBC science coverage. In order to reach a view on this it commissioned an independent report from Steve Jones, Emeritus Professor of Genetics at University College London, together with content analysis from the Science Communication Group at Imperial College London. This work has now been completed and assessed by the Trust. It has produced a number of important findings: the most welcome being that BBC content in this area is generally of a high quality. In particular, it is judged to be a thriving and improving genre of programming, which is well established across a wide range of BBC services. It is also described as "exemplary" by Professor Jones in its precision and clarity.

The report and content analysis do, though, highlight certain shortcomings. These include a lack of contact and cooperation between science programme makers across BBC divisions; an over-reliance on a narrow range of external information sources; and, crucially, concern about the appropriate application of editorial guidelines on "due impartiality" in science coverage. Professor Jones recommends measures to address these issues.

Given this, although Professor Jones finds much to praise, the Trust welcomes the fact that the Executive in its response is open to the suggestions for improvement that the report makes, has set out steps towards this and plans to monitor their efficacy. In particular, as set out below, the Trust is concerned that new editorial guidelines on "due impartiality" (introduced in 2010) are used appropriately and effectively in science coverage. Programme makers must make a distinction between well-established fact and opinion in science coverage and ensure the distinction is clear to the audience. The Trust is also concerned that the BBC maximises what Professor Jones acknowledges is the considerable scientific expertise held within the organisation so that everyone involved in its science coverage can take advantage of it. This in turn will benefit the audience by enhancing science content across all its services. Finally, as well as drawing on internal expertise, the BBC must do more to draw on external experts, building on its existing links with the scientific community, ensuring that these are shared across BBC divisions and widening the organisation's range of contacts and information sources. Further details of the requirements that the Trust is making of the Executive following this review are set out below, along with the Trust's plans for monitoring the impact of these changes. The Trust will keep a close eye on these efforts.

Context

The BBC Trust represents the interests of licence fee payers in its oversight of the BBC Executive. Licence fee payers rightly expect the highest of standards of accuracy and impartiality from the BBC and the Trust must do all it can to ensure this expectation is met. Monitoring editorial standards in the pursuit of excellence is central to the Trust's work. BBC content must be accurate and impartial in order to safeguard its independence and public confidence and it is a key priority for the Trust that the BBC covers potentially controversial subjects with due impartiality. This is a requirement of its Charter. As such the Trust has a rolling programme of impartiality reviews: this is the third that the Trust has carried out since it was established in 2007. Previous reviews have examined coverage of business and the devolved nations. These reviews include an independent assessment of content from an expert lead author, drawing on any specially commissioned research, and provided to the Trust in order to help it shape its own conclusions. These reviews have been vital in leading to recognisable improvements in coverage for licence fee payers.

The Trust has carried out this review in order to examine the accuracy and impartiality of the BBC's coverage of science across television, radio and online, particularly where it relates to public policy or matters of controversy. The review takes in news and current affairs, as well as factual content across a wide range of programmes including science, general strands and series, natural history programming, one off documentaries and news and opinion from the BBC website. For the purposes of this project science was defined to include not just natural sciences but also coverage of technology, medicine and the environment relating to the work of scientists. It was informed by Professor Jones' report, which incorporated his own insights as a leading figure in the scientific community together with invited submissions from and interviews with other scientists, programme makers, relevant government ministers, MPs and civil servants, the BBC Audience Councils and, of course, the significant piece of content analysis conducted by Imperial College. This content analysis examined BBC science coverage for its accuracy and impartiality over a period of four alternate weeks in the summers of 2009 and 2010. The full content analysis, together with details of those who wrote to or met with Professor Jones, are published as appendices to his report.

Findings

As a backdrop to his findings, Professor Jones sets out the research, economic and social context within which the BBC's science coverage is made and broadcast. The UK produces a tenth of the world's scientific research (though it makes up just 1% of the global population) and is the largest research contributor after the US and Japan. A third of the UK's GDP is produced by science, technology, engineering, and mathematics. There is a demonstrable public appetite for more information about science, and its policy, social and ethical implications, and most people glean this information from the media. In Professor Jones' view, the importance of science to the UK, the public's interest in it, and the role of the BBC in "fostering a scientifically literate society" all underline the huge importance of the organisation's science coverage. Following the success of its 2010 "Year of Science" the BBC should now take stock in order to identify areas of improvement that will enable it to continue to thrive.

Professor Jones makes clear it that, overall, BBC science content is of a very high calibre, has improved over the past decade and outstrips that of other broadcasters both in the UK and internationally. It is commended by a number of external scientific bodies for its

accuracy, diverse appeal and inclusion in a wide variety of programmes – from dedicated series such as Horizon to individual items on Woman’s Hour. However Professor Jones believes that there is room for improvement and sets out some areas of concern and associated recommendations.

The most significant of these are:

1. An at times “over-rigid” (as Professor Jones describes it) application of the Editorial Guidelines on impartiality in relation to science coverage, which fails to take into account what he regards as the “non-contentious” nature of some stories and the need to avoid giving “undue attention to marginal opinion”. Professor Jones cites past coverage of claims about the safety of the MMR vaccine and more recent coverage of claims about the safety of GM crops and the existence of man made climate change as examples on this point. He suggests that achieving “equality of voice” may be resolved by the new 2010 Editorial Guidelines which incorporate consideration of “due weight” in relation to impartiality. A more common-sense approach to “due impartiality” would also help, he believes.
2. Underdeveloped links between science programme makers across the BBC’s divisions. This he recommends might in part be addressed by establishing a regular cross-division science forum and appointing a Science Editor for BBC News to work across a range of output.
3. Too narrow a range of sources for stories and a tendency to be reactive rather than proactive, particularly in news coverage. Professor Jones recommends that this might be remedied by better use of external electronic databases that draw from a wide variety of science publications. He further recommends working to improve – and share – BBC contacts with the science community.

The content analysis carried out by Imperial College London also produced a number of important findings. Reassuringly, the researchers found no significant factual inaccuracies in the coverage that they analysed. They also found science coverage spread across a wide range of BBC content, in both news and non-news and specialist and non-specialist output. However, in only a minority of cases did the researchers find that contributors to this coverage made “cautionary comments” about scientific claims. Such comments were least likely to feature in news items by science correspondents. Moreover, three quarters of broadcast news items about scientific research related to stories where the institution that was the source of the story had provided a press release. Although publication of a press release does not necessarily mean that the BBC initiated its story in this way, the significant proportion of stories that were also press released does suggest that this is an issue which needs to be given consideration and explored. The content analysts also found that two thirds of broadcast news items about research arose out of publications. In only one third of these cases was the source publication cited, with *Nature*, the *Lancet* and the *British Medical Journal* accounting for nearly all such citations.

In addition to these findings, Professor Jones also draws attention to other issues arising from the content analysis. These include: a disproportionate number of men presenting science programmes and contributing to content as scientists, relative to the actual numbers of male and female scientists in the UK; the domination of science stories emanating from the South East of England in network content (this was also raised as an issue by those in the devolved nations); a lack of content considering science in a social context (here Professor Jones cites as an example the dearth of scientists appearing on Question Time);

an excess of coverage of astronomy, anthropology, geosciences, ecology and evolution (particularly on television) and of medical stories in broadcast news in relation to their weight in the scientific world; a lack of science content in non-dedicated strands on Radios 1, 2 and 3, and on BBC3 (although, as detailed above, the breadth of coverage across the BBC is generally strong, with other stations such as Radio 4 and BBC4 excelling here).

Overall, Professor Jones concludes that, although BBC science coverage is in a healthy state, there are some key editorial and organisational shortcomings that should be addressed and for which he offers solutions, in order to look to "continuing improvement".

The BBC Executive's response to Professor Jones' report

The Executive welcomes this generally positive assessment of BBC science coverage. It also recognises the imperative of "continuing improvement" and believes that, with some reservations, Professor Jones' report is a valuable contribution to this effort. The Executive accepts and builds on the recommendations set out by Professor Jones, most notably to:

- appoint a Science Editor for BBC News whose role, in addition to broadcasting, will involve liaising with other BBC areas, advising on news coverage, strengthening the BBC News database of interviewees and assessing the weight of coverage of different fields of science relative to the weight of scientific work
- create a pan-BBC science forum that meets twice yearly, its aims to include sharing information in order to improve the pool of interviewees and the balance between men and women on air
- review its information sources with a view to widening and strengthening them, subject to cost considerations
- strengthen its contacts with the scientific community, including by building on the work of BBC Science in this area.

In relation to Professor Jones' concerns about the rigid application of "due impartiality" guidelines, the Executive notes that the treatment of a scientific story will depend upon its nature and context. Sometimes it is appropriate to present it as a debate within the scientific community whereas at others a range of views, including from non-experts, is justified given the social, political and cultural context. In addition to the potential effect of the new editorial guidelines on "due weight" within impartiality, the Executive itself proposes two specific measures to improve programme makers' understanding of these issues: a College of Journalism online training module on impartiality in science; and two seminars to be held in 2011/12 with scientists to debate current scientific issues and their coverage.

The Executive also makes its own proposal regarding network coverage of science stories outside the South East of England: that the BBC News science unit be required to liaise with the nations to ensure proper representation of their scientific work. The Executive notes that the move to Salford and heightened awareness of nations' coverage following the Trust's Nations Impartiality Review should also have an effect here.

The Executive proposes to monitor the efficacy of these measures via quarterly updates on coverage from the Science Editor to the Editorial Board and, one year on from this Trust review, its own Editorial Standards Board review of the impact of any changes implemented.

Trust conclusions

The Trust is grateful to Professor Jones, those who worked with him on his report and to the Science Communication Group at Imperial College London for their considerable work. The Trust accepts the broad findings resulting from these efforts. It also thanks the BBC Executive for its considered response.

The Trust welcomes the clear finding that BBC science coverage is generally of a very high quality. Given the Trust's duty to ensure that the interests of licence fee payers are served, together with the public expectation of the highest of standards from the BBC and the organisation's role in informing the public about science, this is an important conclusion.

Nonetheless, the Trust is concerned about the deficiencies in coverage that Professor Jones and the content analysts identify. In particular, the lack of contact across BBC divisions involved with science content; the too narrow range of external information sources; and, most significantly, the questionable application of "due impartiality" guidelines in some instances. In order to ensure the "continuing improvement" that Professor Jones rightly identifies as vital, these issues must be addressed.

The Trust endorses all the recommendations put forward by Professor Jones, and agreed on and added to by the Executive, to remedy the shortcomings identified.

Proposals to improve interaction between divisions and to strengthen the authority and diversity of coverage by appointing a Science Editor in BBC News and establishing a pan-BBC science forum (alongside other measures) are welcomed by the Trust. In addition to a Science Editor's impact on news coverage, their attendance at the science forum, as proposed by the Executive, offers the opportunity to strengthen connections between BBC News and the rest of the organisation and enable both to draw on each others' expertise. It is essential that non-science specialists involved in making science content access in-house expertise as a matter of course in order that the audience is offered the most authoritative programming possible. The Trust also welcomes the Executive's proposals, based on Professor Jones' recommendations, to take steps to improve contact between scientists and the BBC, and separately to examine use of electronic databases and search engines and review attendance at scientific conferences with the aim of improving the BBC's range of sources. The Trust notes the recent BBC Vision initiative in which a panel of experts met with staff from its science department in order to boost ties with the scientific community. Such projects have the potential to increase programme makers' awareness of potential stories and the latest trends and concerns in the field of science and enhance BBC coverage accordingly. By the same token, scientists themselves may well benefit from the BBC and peer contacts that they make at these events. The Trust looks to the Executive to continue and expand on this initiative, as it has indicated it intends to do so. It also welcomes the Executive's plans to hold College of Journalism seminars with scientists. In relation to the use of electronic resources and attendance at conferences, the Trust acknowledges the need to take into account the cost implications of any changes here, as set out by the Executive. It is also mindful of programme makers' need to prioritise their time carefully, given the current financial constraints faced by the organisation.

Turning to the key issue of "due impartiality" in science coverage, the Trust agrees with Professor Jones that "there should be no attempt to give equal weight to opinion and to evidence" and notes that, although he identifies some weaknesses, Professor Jones believes the BBC has gone to efforts to find an appropriate balance in this area. It also supports the Executive's observation that "due impartiality" should be applied in different ways depending

upon the nature and context of a story. Appropriate, flexible use of these guidelines is essential and it is important to consider factors such as individual remit and audience as well as the distinction between well-established fact and opinion. In relation to the latter, programme makers must use their own, and draw on others', scientific knowledge in making this distinction. They must also clearly communicate this distinction to the audience. A "false balance" (to use Professor Jones' term) between well-established fact and opinion must be avoided. This does not mean that critical opinion should be excluded. Nor does it mean that scientific research shouldn't be properly scrutinised: as Professor Jones states "the expert is sometimes wrong" and robust research will stand up to this analysis. The Trust notes the potential effect that the new guidelines on giving "due weight" to the diverse areas of argument may have and welcomes the Executive's own additional proposals in this area. It hopes that these initiatives will boost editorial judgement and confidence and, in particular, encourage senior editorial staff to discuss these critical editorial concepts face to face with those they manage.

The Trust notes the Executive's plans for ongoing monitoring of impartiality and accuracy in science coverage. The results of the Editorial Standards Board review that the Executive plans to carry out in a year's time should be shared with the Trust. The Trust expects this report to measure the accuracy and impartiality of BBC science coverage, using the findings from this Trust review as its benchmark. The report should include an account of:

- The effect of the new "due weight" stipulation within the editorial guideline on impartiality in relation to BBC science coverage
- The influence of the Science Editor on the quality of BBC News science journalism and content
- The impact of the Science Editor and the pan-BBC science forum on connections between BBC divisions, in-house access to science expertise and the standard of BBC-wide science coverage
- The take up and efficacy of the College of Journalism seminars and on-line training proposed by the Executive together with the face to face follow up that the Trust wishes to see
- The impact of the BBC Vision science panel events on knowledge gathering and output, as well information on the how the Executive has built on these events
- Initiatives to improve contacts with scientists beyond the South-East of England and to feed this into content where appropriate
- The conclusions drawn by the Executive in its review of the use of electronic tools and science conference attendance, together with details of any changes made and their effect
- Initiatives to better reflect the balance of male and female scientists in the UK in BBC content and their impact.

The Trust will publish the Executive's report in 2012.

BBC Trust
July 2011

BBC COVERAGE OF SCIENCE

BBC EXECUTIVE RESPONSE TO PROFESSOR JONES'S REPORT

We welcome the report by Professor Jones and his key findings that our coverage of science is accurate, impartial and of a high quality. We also welcome his suggestion that both the quantity and quality of our output have improved over the past decade, that there is “a real *esprit de corps* about science within the Corporation” and that “the BBC is widely seen as the most dependable and wide-ranging source of information in the UK, and it ranks perhaps highest of all when considered in global context.”

While Professor Jones praises the breadth, depth and professionalism of our coverage, we should not, as he says, be complacent. We recognise his report is a valuable analysis of our output and consider it can contribute significantly to our thinking about how to ensure the “continuing improvement” of our coverage, as Professor Jones puts it.

This report responds positively to the recommendations by Professor Jones and sets out a plan for action for the future, including proposals to develop our strategy for coverage and for measuring success.

We accept all of his recommendations, with one amendment:

- We propose to appoint a Science Editor for BBC News, rather than for the whole of the BBC.
- We accept the proposal to create a pan-BBC science forum to exchange information on science coverage.
- We recognise the need to develop a greater variety of sources of information by reviewing our current use of databases, subject to considering the cost of any changes.
- We will set in place measures to create a ‘new engagement’ with scientists as Professor Jones calls it.

We also propose two further measures in response to the report, although they do not form part of its actual recommendations.

Professor Jones describes incidents of what he calls “false balance” and suggests there may sometimes have been “an over-rigid application of the (editorial) guidelines to what is essentially a fact-based field. This can produce an adversarial attitude to science which allows minority, or even contrarian, views an undue place. The BBC has tried hard to find a suitable balance.”

There will of course be occasions when a scientific story should be presented as a debate purely and simply within the scientific community. There will be others when it is appropriate to broadcast a range of views, including some from non-experts, because

science cannot be divorced from the social, political and cultural environment in which it operates.

As Professor Jones notes, there are new BBC guidelines on “due weight” when making editorial judgments about impartiality.

We propose to take two specific measures to improve our journalists’ understanding of impartiality in science and the way items should be presented.

- The College of Journalism will establish an online training module for staff on this specific topic with input from BBC editorial policy
- The College will run two seminars in 2011/12 with a selected panel of scientists to debate current issues and their coverage in the media

RECOMMENDATION: TO APPOINT A ‘CHIEF ADVISER, SCIENCE’ OR AN ‘EDITOR, SCIENCE’

“There should be more interaction among the elements of the BBC involved in science output. An improved tie between News and other centres is particularly important given its shortage of science specialists compared to its expertise in other areas... a post of “Editor, Science” within News or “Chief Scientific Advisor” across the whole Corporation might improve matters.”

Our response:

We accept the recommendation to appoint a Science Editor, which we will advertise both internally and externally. In our experience this should be a broadcast role applicable to BBC News, rather than for the BBC as a whole. There are no precedents for an over-arching or non-broadcast role such as a ‘chief scientific adviser’ and in our view it would be impractical for one person to oversee the whole of the BBC’s science coverage. We do, however, see the merit of the suggestion so far as it applies to BBC News. It would put science on a par with other established and important areas of coverage, such as politics, economics, business and world affairs. A Science Editor will enable us to establish and oversee the various recommendations of Professor Jones’s report so far as they apply to News and, with the other steps we outline, will help further the process in other parts of the BBC.

In addition to his or her broadcast role, the Science Editor will:

- act as a key liaison figure with other areas of BBC output
- act as a source of advice for news programmes to ensure that ‘due weight’ is given to different strands of scientific argument
- help to ensure that the BBC News database of interviewees is strengthened

Separately, Professor Jones notes: “The disjunction between the real output of science and of its image as presented by the Corporation is worth consideration...”

We propose therefore that the Science Editor:

- would take an overview of the weight of our coverage relative to the weight of scientific work

We note Professor Jones’s comments about the dearth of science stories outside the south-east and suggest that the move to Salford of BBC Radio 5 Live and programmes such as BBC Breakfast should help to counteract this. Since the King report we have been particularly conscious of our obligations to report the devolved nations but we would propose one further measure – that the BBC News science unit should be given the specific objective of liaising with the nations to ensure a proper representation of their scientific endeavours

Separately, BBC Scotland will ask the Editor of Question Time to increase the number of scientists on the programme.

RECOMMENDATION: CREATE A SCIENCE BOARD OR FORUM TO EXCHANGE INFORMATION

“There is an undue lack of consultation and cooperation between News and Current Affairs and the main Science departments and between the latter and the Natural History Unit, together with a real under-utilisation of the extensive expertise within Radio Science in spite of much praise for its output. The attempts now made to improve this situation are so far limited.”

“One way forward might be to establish a forum within which those in Radio and Television, in News, in Features and in Current Affairs could exchange information.”

Our response:

As Professor Jones knows we believe that the level of co-operation is greater than he has described and we do not think that BBC science is ‘fractionated’ as he suggests. We recognise, however, the merit of the suggestion that the BBC should establish a Science forum. We propose that this should meet twice a year, and will be attended by representatives from each area of BBC science including the new Science Editor. In its duties, it will try to meet the criticisms contained in Professor Jones’s report. In particular, it will:

- share internal expertise and ideas across the BBC
- take an overview of science output review and discuss science coverage across the BBC to ensure that its scope is broadened
- share information to try to ensure that the pool of interviewees is deepened and that there are more female voices on air

Professor Jones also suggests that he “detected a real feeling of isolation and under-appreciation in (Radio Science). It has not, it seemed to me, been given a full opportunity to demonstrate its abilities and is rarely consulted by other centres of science coverage within the Corporation; in my view to their considerable loss.”

While we do not fully support this analysis, we intend to co-site Radio Science and the BBC News Science unit in the move to W1.

RECOMMENDATION: TO USE THE LATEST TOOLS AND DATABASES

“News should be more proactive in searching out information than at present and other areas should more fully reflect the scientific literature.”

“As far as I could establish, nobody to whom I spoke within the BBC uses the electronic tools central to communication within the profession itself. This leads to a failure to inform and to coverage of only parts of the scientific enterprise through ignorance of its totality.”

Our response:

While we question the degree to which Professor Jones criticises the originality of our journalism, and contest the reliance on press releases that he describes, we accept his recommendations:

- We will examine our use of electronic databases and search engines.

This work will be led by the BBC News science unit, reporting to the News Editorial Board, in liaison with the new Science forum. At a time of 20% cuts under Delivering Quality First, however, we will have to bear in mind the cost implication of any changes, although we note Professor Jones’s suggestion that this will be modest.

We also note Professor Jones’s comment that “another potential source of new results is the scientific conference...Perhaps a better balance of investment across a wider range of meetings would give a wider view.”

In addition to examining our use of databases, therefore, we propose that:

- BBC News will review its attendance at scientific conferences

This work will be led by the new Science Editor and the head of newsgathering, reporting to the Director of News’s Editorial Board. Any changes will, of course, be subject to cost.

Separately, the Content Analysis notes that 54% of items included no links to external sources. The Director of News will ask BBC News Online to increase its commitment to providing links where editorially appropriate.

RECOMMENDATION: TO DEVELOP A NEW ENGAGEMENT WITH SCIENTISTS

“The BBC should keep a watching brief on developments in science communication that arise from changes in funding policy. An active approach to new avenues of engagement with scientists would benefit both parties.”

Our response:

We accept the need to draw up and circulate a central register of potential contacts and are happy to explore Professor Jones’s suggestion that the BBC could take “a more integrated look” at the opportunities that exist to improve contact between the scientific and media communities.

We propose to take two steps to facilitate this aim.

- The Director of News will ask the College of Journalism to explore the possibility of putting together the relevant information on its website where they can be seen by both parties interested in closer collaboration.
- We will build on the work of BBC Science which has already established informal meetings with the scientific community. BBC Vision will take the lead on this and will discuss its progress at the new Science forum.

MEASURING SUCCESS

We believe the measures we have described above will aid the continual improvement of science coverage across the BBC.

The new Science Editor and the policies overseen by the new Science forum and the News Editorial Board will all help in this process, and provide a degree of internal accountability.

The Editorial Board will ask for quarterly updates from the Science Editor on our coverage, enabling board members to discuss any issues with editors to correct any imbalances in its direction of travel.

In addition, in a year’s time, the Editorial Standards Board will review whether the changes we have proposed have been effectively implemented.

**A review of the impartiality and accuracy of the
BBC's coverage of Science**

Steve Jones

EXECUTIVE SUMMARY

This Review aims to “assess news and factual output that refers to scientific findings, particularly where the science is itself controversial and where it relates to public policy and political controversy”. To do so I have consulted widely inside and outside the BBC, have solicited submissions from external sources and have read reports and publications on science in the media. I also assessed numbers of radio and television broadcasts, an enterprise helped by a Content Analysis of science output carried out by Imperial College London.

Figures on the international reputation of British science, on its economic value and on levels of scientific literacy among the public show the relevance of the subject to the Corporation’s mission. My first and most important conclusion is that, in general, its output is of high quality. It is widely praised for its breadth and depth, its professionalism, and its clear, accurate and impartial manner. Science is well embedded into programming, on a diversity of platforms.

Science itself is a unitary enterprise and depends on collaboration, but I was struck by the degree to which the subject is fractionated within the BBC. There is an undue lack of consultation and cooperation between News and Current Affairs and the main Science departments and between the latter and the Natural History Unit, together with a real under-utilisation of the extensive expertise within the Radio Science Unit in spite of much praise for its output. The attempts now made to improve this situation are so far limited.

The title of this Report includes the word “accuracy”. There are few complaints in this regard. The precision and clarity of most material is exemplary, with programmes aimed at levels of sophistication from children to professionals, although channels with a younger audience such as Radio 1 and BBC Three are perhaps somewhat deficient in their coverage.

One hindrance to impartiality emerges from limited access to information. Although features programmes range quite widely and gain from contact with scientists too many news items emerge from press releases or from a small range of journals. As far as I could establish, nobody to whom I spoke within the BBC uses the electronic tools central to

communication within the profession itself. This leads to a failure to inform, and to coverage of only parts of the scientific enterprise through ignorance of its totality. I suggest some escapes from this problem.

The discussion of science, and of policy, by the BBC is of high quality but there is little input from Science specialists into policy reporting and vice versa.

The central element of this review is Impartiality. The BBC produced a new set of editorial guidelines during its preparation (Annex 1) and the programmes I mention were made under the previous criteria. Although the new document is more precise in its advice, I found disagreement about how the word should be interpreted and about whether science demands a version of its own. Broadly speaking, the split is between those in the Corporation with a science background, and those without. Most of the latter claim that the criteria set out in its earlier From SeeSaw to Wagon Wheel: Safeguarding Impartiality in the 21st Century paper and in the latest Editorial Guidelines suggest that to apply due impartiality across all output, science included, must involve a variety of opinions. The former point out that much of the topic is not contentious and does not demand the airing of opposed views found in, for example, politics. There can be an over-confrontational tone to science news (although features suffer less from this problem). Equality of voice calls for a match of scientists not with politicians or activists, but with those qualified to take a knowledgeable, albeit perhaps divergent, view of research. Attempts to give a place to anyone, however unqualified, who claims interest can make for false balance: to free publicity to marginal opinions and not to impartiality, but its opposite. Conflicts of interest and outright dishonesty exist in science and these must be exposed, but not at the cost of an over-literal interpretation of the guidelines. The BBC has tried to find a solution to this problem but has not entirely succeeded. It must accept that it is impossible to produce a balance between fact and opinion. The notion of due impartiality in science should be treated with more flexibility. The central criterion of the new Guidelines, that the BBC should seek to achieve “due weight” in its coverage of perspectives and opinions and that minority views should not necessarily be given equal treatment, may do something in this regard although proof of that has yet to emerge.

Representatives from Scotland, Wales and Northern Ireland felt that there is a shortage of

network reports of science from the nations. I end with an account of changes in science communication which may help the BBC's search for an impartial treatment of that enterprise.

I suggest that the BBC tries to develop links among its science outputs, perhaps with an "Editor, Science" with a role modelled on that of a government department's Chief Scientific Adviser, or with a consultation forum. News should be more proactive in searching out information than at present and other areas should more fully reflect the scientific literature. I recommend that the BBC takes a less rigid view of "due impartiality" as it applies to science (in practice and not just in its guidelines) and takes into account the non-contentious nature of some material and the need to avoid giving undue attention to marginal opinion.

INTRODUCTION

The BBC Trust is the governing body of the BBC and is independent both of BBC management and of external organisations. Its remit is to act in the best interests of licence-fee payers. To do so it aims to increase the distinctiveness and quality of the Corporation's programmes, to improve value for money, to insist on openness and transparency and to serve all audiences. A March 2010 strategy document, *Putting Quality First*, confirms the BBC's mission to "inform, educate and entertain" and notes that as a public service the organisation must distinguish itself from other broadcasters, must hold the trust of its audiences and must generate programmes that inspire, entertain, and delight.

As part of its regulatory role, the Trust has over the past several years commissioned a series of Reviews on the impartiality and accuracy of the Corporation's output. The most recent dealt with its coverage of business matters and of the extent to which network News reflects the devolution of power to Scotland, Wales, and Northern Ireland. Each report makes recommendations, many of which have been acted upon by the BBC.

The present Review has, in its Terms of Reference (Annex 2), the statement that it "will assess news and factual output that refers to scientific findings, particularly where the science is itself controversial and where it relates to public policy and political controversy". It asks "whether assertions about scientific theories are well sourced, based on sound evidence, thoroughly tested and presented in clear, precise language". The criteria also question "whether the output gives appropriate weight to scientific conclusions including different theories and due weight to the views expressed by those sceptical about the science and how it was conducted or evaluated".

This Review is in the tradition of previous exercises but has a wider range. It includes news, features and current affairs on radio and television, together with web output. It does not include drama, the World Service, or the Corporation's written contributions (such as *Focus*, the science magazine). I interpret my remit in broad terms and have attempted to consider pure science (medical science included, but not health advice), natural history (much of which is science based), engineering and technology. I have also looked at how science is presented in economic, social and political contexts.

The attempt to fulfill the Terms of Reference included:

- Face to face one hour interviews (almost all carried out with the participation of my colleague Sarah Hargreaves, previously Head of Editorial Standards and Training for BBC Vision and Head of Documentaries and Specialist Features at the BBC) with some seventy individuals, mostly within the Corporation, but some associated with independent production companies, science journalism, education, or with science itself (Annex 3).
- Group meetings of those involved with an interest in science broadcasting. They include members of the Science Media Centre, of the House of Commons Select Committee on Science and Technology, of the Department of Energy and Climate Change and, within the BBC, of the Natural History Unit and the BBC Radio Science Unit. Towards the end of the process I met with the Editorial Standards Committee of the BBC Trust and discussed with them a draft version of the Review. I also participated in a Wellcome Trust panel on science broadcasting at the Sheffield Documentary Festival.
- Visits to Cardiff, Edinburgh and Belfast, where I had discussions (facilitated by local BBC Trust members) with representatives of the science, academic and business communities (and in Belfast with two Audience Council members) about the extent to which BBC science broadcasting gave due prominence to local concerns. I had a meeting with BBC Scotland science production staff, and spoke also to the Welsh Deputy Science Minister and to the Chief Scientific Adviser for Wales. Excluding the Sheffield event, I have spoken to a hundred and thirty people involved in the public presentation of science.
- Letters to external organisations – scientific societies, educational charities, commercial companies and more – that asked for views on BBC science output. Replies came from around twenty of these (Annex 4). Although no public input was solicited, I have had some correspondence from the online, radio and television audiences.
- An analysis of the breadth of coverage in relation to the scientific enterprise as a whole by comparing the range of topics broadcast with that of the research literature,

using the electronic resources that establish the shape and size of world science. This provided a test of the balance of BBC presentation compared to that perceived by scientists themselves.

This document also refers to a Content Analysis commissioned by the BBC Trust and carried out in 2010 by the Science Communication Group at Imperial College London. They were asked to scan all relevant BBC broadcast and online output for science content and to report on its breadth, accuracy, bias and sources of material. They examined four weeks of output from May to July 2010 and for comparison the same period a year earlier, together with twelve months' coverage in science specialist programmes and a scan of general magazine programmes such as *Countryfile* that might be expected to have some scientific content. The Imperial College team looked at nine thousand news items from across the Corporation. As is always the case for such analyses they were unable to assess the whole science output on all platforms over a lengthy period (and coverage in 2010 was diminished by elections and by the World Cup). Even so the Analysis paints a vivid picture of the BBC's efforts and of its output in comparison with other broadcasters. I have used it extensively. The document is presented as an Annex to this Review (Annex 5).

I refer also to a 2009 Cardiff University report on science journalism (*Mapping the Field: Specialist Science News Journalism in the UK National Media*)¹, to a paper entitled *Science and the Media: Securing the Future*², published by the Science and the Media Expert Group and chaired by Fiona Fox of the Science Media Centre with the assistance of the Department of Business, Innovation and Skills; and to the Research Councils UK 2008 *Report on Public Attitudes to Science*³ and the House of Lords Select Committee 2000 *Report on Science and Society*⁴. In addition I have consulted books and papers in the technical literature that deal with the statistical analysis of scientific publications. I have also listened to and watched broadcasts from a variety of outlets. Where I comment here on particular items I have contacted the programme producer and have taken his or her views into account.

In general, discussions were held under Chatham House Rules: free and open debate, reported with no redaction, but without names attached. With their permission, I do

quote some individual opinions from senior figures within the BBC. One example comes from Sir David Attenborough (in a social context rather than a formal interview). BBC science coverage, he said, stands “head, shoulders, thorax and abdomen” above that of any other broadcaster. My review gives the BBC head and shoulders, and probably thorax, but suggests that we need to talk about the abdomen.

APOLOGIA PRO VITA SUA

I have been – to my dismay – a practising scientist for forty years and still have research under way although I retired from my post as Head of the Department of Genetics at University College London in 2010. My interests are population genetics and evolution, particularly of snails, fruit-flies, and humans. I have published over a hundred papers on these subjects. I have also been involved with the presentation of science to the public, with several popular science books and a regular science column in the *Daily Telegraph*, now about to reach its 400th episode. In addition I have appeared on BBC radio and television in *Start the Week*, *In Our Time*, *Science Now*, the *Today* programme, *Newsnight* and a variety of science documentaries. In 1991 I gave the Reith Lectures on *The Language of the Genes* (and they were the basis of my first popular book) and in 1996 had a BBC Two series on human genetics and evolution, *In the Blood*. I also presented a science and the arts series on Radio 3 called *Blue Skies*. I have various honorary degrees and prizes, including the Royal Society Faraday Award for the Public Understanding of Science. In addition I am President of the Association for Science Education, Vice-President of the UK Genetics Society, and am on the board of the British Council. Perhaps a less distracted scientist would have been a better author for this report.

When applying for a position long ago I was asked to characterise my knowledge of biology. I replied – honestly, although it lost me the job – that it was remarkably broad, but fantastically shallow. Since then my insight into science has become yet more expansive and even more lacking in depth, which, fatal though that is to a career, may be what is needed to assess coverage of the subject across the enormous range of BBC output.

I have been much helped in this task by Sarah Hargreaves. I thank her for that, for her expertise at navigating the Corporation's corridors of power and for her insight into the world of factual broadcasting. In many ways this document is a joint effort of Sarah Hargreaves and myself. It also benefited from the input of Helen Nice, who had worked on several impartiality reports for the BBC Trust and before that for the BBC Governors. I thank also the many people to whom we spoke or corresponded for their willingness to spend time discussing the topic.

BRITISH SCIENCE IN CONTEXT

The BBC plays a large part in reflecting British society as a shared but diverse way of life. It may be helpful to put science into context and to suggest why the Corporation should be involved in reporting that activity.

Science has long been a major element of our national culture and is of immense economic importance. Much of the public, many politicians, and parts of the media appear to be unaware of that fact. They need to be reminded of quite how large a part it plays in our social, political and economic position. Britons have always been proud of their admirable talent for self-denigration, but the figures tell their own story⁵.

The UK ranks third in the world in the numbers of science Nobel Prizes per head (after Switzerland and Sweden, but ahead of the United States, and twice the figures that emerge from Germany and three times those from France).

With only 1% of the global population it produces a tenth of world research and is the third largest contributor to that effort after Japan and the United States. It does so efficiently, spending less government money on the enterprise than any other nation in the G8, apart from Italy. In 2008 we invested 2.8% of GDP on science, half the proportion spent by Japan, and two thirds that of the United States. That figure is decreasing.

One way to visualise the strength of UK science is to use the statistical analysis of scientific publications. The diagrams (Figs 1 and 2) below show the numbers of scientific papers by different nations, while the thickness of the connecting lines demonstrate the extent to which each country's research is referred to by others^{6,7}. The prominence of UK science, both in size and connectedness, is clear, as is its dominance (measured by the numbers of citations in other scientific publications) within Europe.

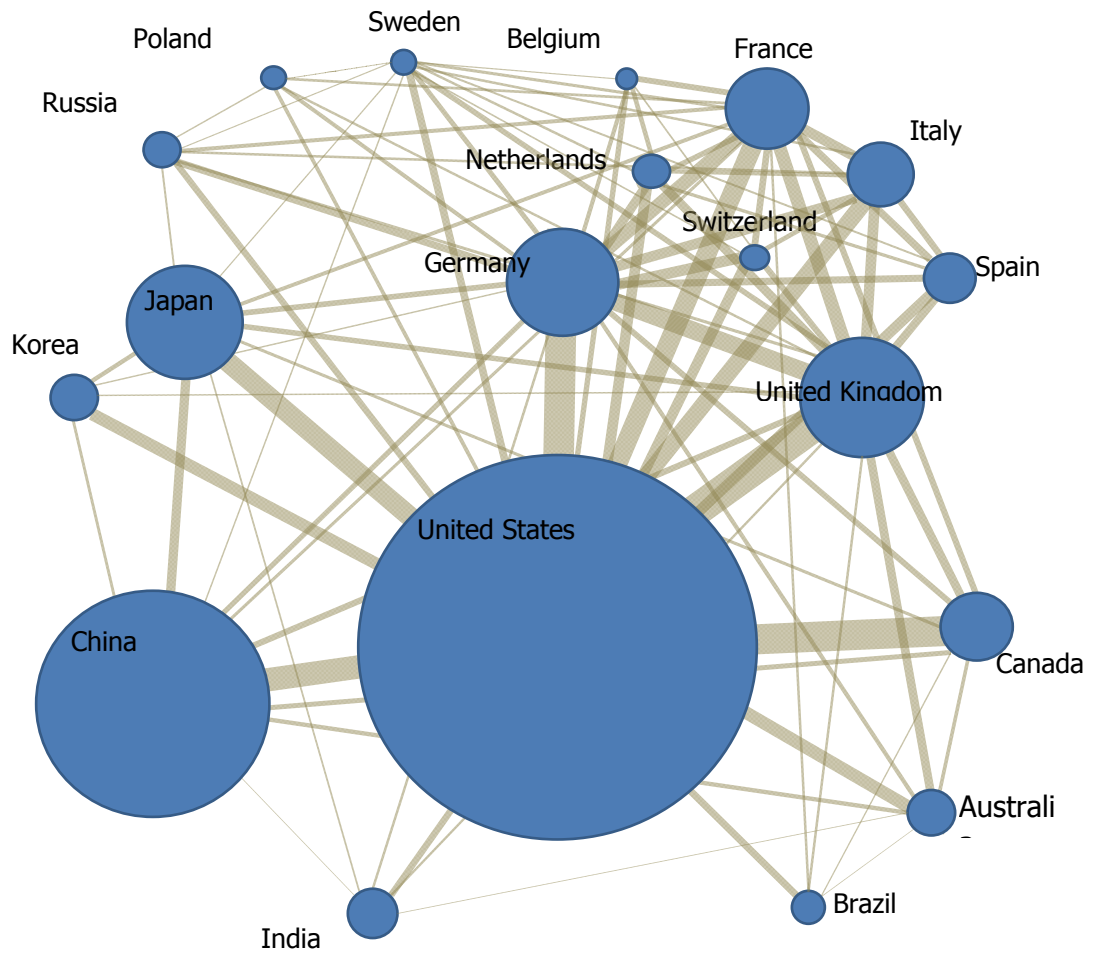


Fig. 1 National Origin and Interconnectedness of the World Scientific Literature



Fig. 2 The Geography of Highly Cited Science

In 2009 the House of Commons Committee on Innovation, Universities, Science and Skills⁸ estimated that a third of the UK's Gross Domestic Product is produced by science, technology, engineering and mathematics. In 2008 the UK provided one part in eight of OECD venture capital going to scientific and technological enterprises and ranked sixth, worldwide in the numbers of patents issued.

British science education has an international reputation; the nation's universities have a higher proportion of foreign students studying such subjects than any other apart from Australia. A quarter of all British university degrees are in science and engineering and almost half of all graduates in the workforce have such a qualification. The UK has in addition more foreign PhD students than anywhere else apart from the United States⁵.

The *lingua franca* of the profession is English, and one can visit any scientific laboratory in the world, go to any conference, or read every major journal without venturing into a foreign tongue. It is hard to deny that science plays a major part in society and that it deserves extensive, accurate, and unbiased coverage.

Not all the news is good. A recent survey that used True/False questions such as "The oxygen we breathe comes from plants", "Electrons are smaller than atoms", "Antibiotics kill viruses as well as bacteria" and "All radioactivity is man-made" puts the British public no higher than number eleven in the European Union for general scientific knowledge⁹. In schools, too, we lag. The OECD's PISA (Progress in International Student Assessment) programme assesses the scientific and mathematical literacy of 15-year-old students in its 34 member countries using standardized questions¹⁰. In 2009, the UK ranked 22nd in mathematics (an "average" score), and 11th in science (notably above average). Shanghai came top for all subjects but this is a city rather than a nation. Finland, South Korea, Japan, New Zealand and the Netherlands do well and the United States is far down the list. So good is the correlation between this statistic and economic growth that the OECD estimates that if UK levels of science and mathematics were to rise to those of Finland, Britain would generate, over the lives of those born in 2009, an additional seven trillion dollars of activity. Such figures are speculative but show the overwhelming importance of scientific literacy to our economy.

The Research Councils UK 2008 survey of Public Attitudes to Science³ reports that 79% of

the population thinks that science plays a major part in their lives; a proportion that has increased over the past decade even as that of people who state that they feel uninformed about the subject has gone down by half. Even more are “amazed by the achievements of science”. The poll also shows that 57% of Britons are very interested in new medical discoveries and that many place them in the top rank of their interests. All those topics rank higher in the numbers “very interested” than do sport (32%), religion (17%) and politics (15%), although younger people (from 16 to 24) put music and films ahead. Only one in twenty of those surveyed said that they were not at all interested in science. For some reason the Welsh are less attracted by the subject than are other inhabitants of these islands.

To emphasise the role of the BBC in fostering a scientifically literate society, a 2004 MORI poll found that 84% of those questioned said that they received most of their information on science from television news, from documentaries and from other programmes. Sixty per cent of the population felt that scientists themselves did not do enough to explain their work to the public and only one in five feels that the public is sufficiently involved in decisions about science and technology⁹.

The importance of science broadcasting hence cannot be overestimated. 2010 was the BBC’s “Year of Science”. It was a success. To continue to thrive it is essential that the Corporation look carefully at its output and identifies whether, where and how it may need improvement. This document is a first step towards that task.

ATTITUDES TO BBC SCIENCE BROADCASTING

One thing should be made clear: BBC science broadcasting is seen as of high quality and is much praised for its accurate and impartial approach, its breadth, and its professionalism. Comments from the submissions made to this Review show how widespread is this opinion:

The Royal Society. Science coverage in general on the BBC is healthy, particularly in this “year of science” ... Coverage of issues such as food security has tended to represent the full scientific and political complexity of these issues.

The Wellcome Trust. We consider that the BBC is accurate and impartial in its science coverage ... we recognise the high quality the BBC achieves across the breadth of its science programming.

Research Councils UK. Overall, the BBC should be commended for their coverage of science. It is second to none in the UK for its spread, depth and maturity.

Academy of Medical Sciences. We are generally satisfied with the BBC’s coverage of science and consider it broadly impartial.

Association for Science Education. In addition to the high profile programmes, some of the science inserts in programmes have also improved. One member cites *The One Show* as presenting usually good rigorous science, well presented and well explained.

Institute of Physics. Overall, we believe that the BBC takes the issues of impartiality and accuracy very seriously and in general strikes the correct balance. The experience of those of our members who have been involved in programme making with the BBC highlights the care and time that goes into fact checking statements.

British Ecological Society. Considering the BBC’s Radio output we have had a number of positive comments [from our members] about the news and farming programmes, specifically on Radio Four (such as *Today*, *PM*, *More or Less*, *Home Planet* and *Farming Today*) which are seen to present well-researched content in an impartial manner, with a few exceptions.

Linnean Society of London. [There was] excellent coordination around scientific themes and topics throughout the 200th year of Charles Darwin's birth in 2009. This coordination across the whole of the BBC was an excellent example of the BBC at its best.

Society of Biology. The Society regards the BBC's efforts to be impartial and accurate to be widespread and genuine.

Royal Meteorological Society. We have been delighted that the new digital channels have provided a platform for the BBC to broadcast a much greater and more diverse range of science programmes.

Department for Business, Innovation and Skills. I [David Willetts MP] recently wrote to Mark Thompson to praise what I consider to have been an excellent year for science at the BBC. The range and quality of coverage has been very impressive, catering for a broad spectrum of audiences.

Department of Health. In covering science and health research, BBC news correspondents are responsive, diligent fact-checkers that seek balanced comment ... If given continued support at senior levels, the organisation's science output will continue to evolve in order to challenge and entertain the audiences of the future.

Rolls-Royce plc. We found the staff of the BBC Science Unit thoroughly professional, robust in their thinking and editorial standards, and enthusiastic about learning the intricacies of our highly complex industry and explaining them to a general audience.

An organisation that can obtain praise from such a diversity of sources has a lot with which to congratulate itself. I asked almost everyone interviewed during the preparation of this Report an introductory question, "What is the best thing about BBC science broadcasting?" There was an impressive breadth of response with mention made of the depth and extent of coverage, of the investment in production, of the ambition and expertise within the Corporation, of the talent to simplify complex topics and of its commitment to science as part of the mission to inform, educate and entertain. The departments involved have confidence in their abilities: at the Natural History Unit I was told, with some assurance, that "we are the best in the world" – and I was, grudgingly, forced to agree.

Another persistent theme was that both the quantity and quality of output have improved over the past decade. This is reflected in public attitudes. In its 2000 report the House of Lords Select Committee on Science and Technology⁴ claimed that “Society’s relationship with science is in a critical phase” and that “public unease, mistrust and occasional outright hostility are breeding a climate of deep anxiety among scientists”. They blame that, *inter alia*, on increasing “ghettoisation” of the subject in the media (the BBC included) and on a tendency for non-science journalists to produce provocative pieces with no input from experts. Although that problem has not gone away nobody would use such apocalyptic language today. BBC coverage has a lot to do with that. The Corporation could do even more: in the Research Councils UK’s recent survey of public attitudes³ about half the population feels that about the right amount of information is available, but another third would like to see or hear more, suggesting that there may be room for further expansion.

The quality of production is not in doubt and neither is its quantity. The Content Analysis found more than eighty outlets with substantial science input, not counting news. In the period under review one in four news broadcasts included at least one science report while for the main Television bulletins this rose to a remarkable one in two; even more – according to a survey carried out a decade ago – than in the broadsheet press. The *Today* programme is particularly notable for its interest in science, and – in spite of the time pressure under which it works, and the difficulty of obtaining interviewees at an unearthly hour – succeeds in covering the subject in a high proportion of its output with between seventy and eighty items within the Imperial College study framework.

Panorama, too, has a consistent investment; the Content Analysis showed that one programme in eight was science-based during the survey period. In the non-news area around 2% of all output contains material of this kind. Radio 4 broadcasts several hours a week of non-news scientific material and the BBC’s websites are notable in the extent to which they include this topic.

The Analysis shows that some, perhaps predictable, gaps remain. Even relative to the proportion of women in senior scientific positions there is a shortage of female voices on air. For Radio 4’s *Material World* no more than one in twelve of those interviewed was female while for *Horizon* just one in twenty of the surveyed episodes was presented by a

woman. A glance at the sex ratio in university classes in biology, physics and chemistry suggests that the days when the subject was a masculine preserve are over and that some attention should be paid to reflecting that. The recent BBC Two programme *Do We Really Need The Moon?* presented by Dr Maggie Aderin-Pocock shows what could be done.

The Imperial College research on output also shows that one of the Corporation's strengths is its use of science in strands not dedicated to this area: on Radio 4 *The Food Programme*, *Off the Page*, *Book of the Week*, *Start the Week*, *In Our Time*, *Woman's Hour* and others often include it, and on television the popular early-evening *The One Show*, *Blue Peter* and *Countryfile* have frequent items aimed at an audience that might not choose to sample a programme specific to the subject. However, not all BBC outputs join in – there is little mention of science on Radio 1 or Radio 2; and Radio 3, although it sometimes interviews scientists in *Night Waves*, has no dedicated slot. Radio 5 Live covers the subject in phone-ins and has some news input. On television, BBC Three is notably science-light (with, according to the Analysis just three hours cover in the eight surveyed weeks) while BBC Four, in contrast, excels in in-depth documentaries.

All this should be put into context. In the United States, the CNN news channel has ended its specialist treatment and in Britain the commercial TV channels have almost abandoned the field (according to the Content Analysis only one ITN news item in fifty deals with it and ITV itself has almost no interest). Channel 4, which at one time had a dedicated science strand now produces only occasional documentaries (although it has reasonable news coverage). The BBC, in contrast, has, according to the Cardiff study, increased its numbers of specialists from two to thirty in two decades. One achievement has been to broaden the audience: as one interviewee said, it is easy to satisfy a target group; what is harder is to persuade the others, sometimes without their realising. Very often, the BBC succeeds.

There is a real *esprit de corps* about science within the Corporation. The BBC is widely seen as the most dependable and wide-ranging source of information on the subject in the UK, and it ranks perhaps highest of all when considered in global context. It would not, of course, wish to allow itself to become complacent but all this should be

remembered when considering some of the more critical comments that emerge later in this Report.

ORGANISATION OF SCIENCE WITHIN THE BBC

Philosophy is of value to science in the way that ornithology is to birds. Most scientists care not at all about what the world's deepest thinkers might say about their profession, but all are aware of belonging to a vast and shared global enterprise which works, more or less, to the same rules. Science is a way of knowledge. It is the only true international culture and its approach is shared by all who practise it, whether they study insect behaviour, the chemistry of chlorine, the mathematics of chaos or the inner structure of the Sun. Although the trade is more subdivided than it should be and although there are islands of isolation and peaks seen by those who occupy them as elevated far above the troughs occupied by lesser breeds (snail experts included), the profession as a whole is open, fluid and highly interactive. Some of the greatest advances have come from collaboration between distantly related fields: in genetics, for example, of physicists with biologists when studying the structure of DNA and of mathematicians with chemists when reading off the human genome. Such cooperation is promoted by its funders, and its importance is (or should be) drummed in to all students, whether at school or at university.

That fact does not seem to have percolated into the British Broadcasting Corporation. I was surprised and disappointed from the outset of this project to discover how fractionated and even hostile relations among the various production units sometimes appear to be. Although there have been recent attempts to break through some of the barriers I found little evidence that many of those involved in this aspect of broadcasting feel themselves to be participants in a shared enterprise of bringing science to the public.

In an organisation as large and as dispersed as the BBC this is to some degree hard to avoid, but the boundaries do appear to be unnecessarily impermeable. Many of those interviewed bemoaned the fact that Vision rarely spoke to News or to Current Affairs, or that Radio scarcely talked to Television; or that Natural History was isolated from the main thrust of science programming and that web coverage received little input from elsewhere. This appears to me to be an impediment to presentation and in these straitened times also to be a source of waste and inefficiency. More important, it increases the dangers of bias and inaccuracy when isolated and independent entities fail

to consult the mass of expertise available across the organisation as a whole. Impartiality – the central element of this Review – depends on equality of information. If one party – perhaps the presenter of a BBC News report – is less well informed than are his or her subjects (who are often willing to offer a carefully selected subset of facts to promote their own agenda) it becomes impossible to engage in a balanced debate. The BBC should look hard at how it shares its internal expertise.

There are many missed opportunities. For example, given that so much of what the Natural History Unit does is science-based, and given its unique talents in filming the natural world, its isolation is surely to be regretted (although it should be noted here that the NHU is unique in Features in that it has a fully integrated Radio department, which produces all Radio natural history, together with an extensive web presence). As the British Ecological Society in their response to my letter of enquiry said of their spectacular television programmes, their “stimulating images ... did not correspond to equally stimulating content”. Some of the NHU’s members told me that they were warned to avoid topics – including even those emerging from research in ecology and evolution – that were too scientific; which meant that often, to quote one of them, they made “children’s programmes, albeit superbly good children’s programmes”. Science was, they had been informed by a senior figure, not their job. David Attenborough’s *Life on Earth* series and its many successors are held up as exemplars of what natural history broadcasting should be – and they are unforgettable. They are avidly followed by enthusiasts (myself included). Given that what appears on screen is the product of evolution (and Attenborough himself is a fervent Darwinian) that fact does not accord well with a recent poll that suggests that a third of the British population either does not believe in, or has doubts about, the theory of evolution, while one in six thinks that human beings were created by God within the past ten thousand years¹¹. Perhaps some more explicitly scientific messages mixed in with the wonderful images would help to rectify this.

The personnel of Radio Science have a remarkable breadth of knowledge of scientific topics and the Department possesses a uniquely wide network of experts to whom they can appeal for advice. Science in Vision possesses a matching range of talents. Once again, though, there is too little contact between the two. Many people within and

outside the BBC commented on the expertise, the enthusiasm, the breadth of knowledge and the ability to find interesting stories manifest in Radio Science, but I detected a real feeling of isolation and under-appreciation in that group. It has not, it seemed to me, been given a full opportunity to demonstrate its abilities and is rarely consulted by other centres of science coverage within the Corporation; in my view to their considerable loss.

Some among my interlocutors, it must be said, had a different view about cross-department cooperation: they took almost a perverse pride in remaining as isolated as possible. Their main concern was to ensure that a programme that might be made by their own department was not hijacked by someone else. The commissioning process was, they said, in part responsible, but given the present arrangements isolationism was the only way to survive.

News coverage of science is particularly insulated and its position needs special note. News works largely to its own rules and with its own contacts. Of course, its timescales differ from those elsewhere. It has about a dozen people within its Science and Environment newsgathering team. Those involved in its management pointed out that, within news, there is collaboration on science and environment coverage between television, radio and online. Even so, given its relative shortage of experts in this enormous field, the lack of interaction with science units in other parts of the Corporation is notable. There is as a result a tendency for News (and to a lesser extent Current Affairs) to turn to a limited set of outsiders for comment. This insular attitude is odd given the expertise that exists elsewhere in the BBC, but is almost never consulted. Perhaps the plan to move Radio Science close to News in the new Broadcasting House will ameliorate some of this but at present there appears to be almost no contact between them.

This is a potential obstacle to impartiality and accuracy; if BBC News does not take full advantage of the organisation's specialised know-how – and it possesses far more than any other broadcaster, newspaper or magazine in the UK, with (according to the Cardiff University report¹) around a third of the totality of science journalists in the British media – then it lays itself open to being manipulated by outside interests, to giving fringe views undue prominence, and to missing important stories although others may be aware of

them.

One frequent comment was that the BBC – News most of all – was an arts- and humanities-based organisation and that science suffered as a result. Although some of the best science journalists, within and without the BBC, do not have degrees in the subject it is hard not to notice the dearth of that skill in News and Current Affairs compared to its abilities in finance, politics, sport or the arts. The Science and the Media Expert Group Report of 2010² goes so far as to say that “a double standard is applied when high-profile news presenters proudly admit to having no knowledge of science in a manner that would be very unlikely with subjects such as economics or politics”. I found no evidence of this but it is believed by many within the Corporation. Perhaps News and Current Affairs should improve their interactions with the rest of their employer’s scientific community. The alternatives seem to be either to appoint a specialist to match, for example, its much-praised business editor, or to insist that News and Current Affairs enter into closer cooperation with the experts that the BBC already has.

Several people mentioned a positive relationship with the Open University: *Bang Goes the Theory*, I was told, would not have happened without this tie. The BBC is to be congratulated on this success, but it emphasises the importance of forming links across the whole subject rather than dividing a unitary topic, science, among a series of silos (a word much heard during my conversations).

The BBC needs to consider how to reduce its tendency to Balkanise science. Some said that matters were improving and a number of recent collaborations were brought to my attention. They include attachments between News and Radio Science personnel, and interaction between News and the Natural History Unit’s web presence. There is certainly an impetus in management to change the present mind-set and that is welcome, but the levels of disconnection are still too high. The – still rare – formal exchanges among departments have been a success, as in the News science specialist seconded to *The One Show* for a year or so, which much improved their science coverage. The Natural History Unit is, I believe, about to embark on a joint production with *Panorama*. Such innovations should be built upon.

One way forward might be to establish a forum within which those in Radio and

Television, in News, in Features and in Current Affairs could exchange information. The panel of external experts recently brought together by the science department within Vision is a useful beginning. This pilot hopes to develop ties with the external academic community, but might, by engaging members from News, Features, Current Affairs, and Radio succeed in the perhaps more important task of doing the same within the BBC. The BBC has two Music Boards, Popular and Classical, chaired by Arts and Music controllers. There is an Arts Board, which includes representatives from Radio, TV and News, and a Climate Change Steering Group. There was once a Knowledge Board that brought together expertise across the Corporation but that is defunct. Boards, committees, focus groups, panels and the like are to be deplored on the grounds of bureaucracy but there may be a case for a Science Board that could promote the exchange of ideas and help to bridge the chasms that now exist.

The recent appointment of a Commissioning Editor for Science and Natural History on TV was warmly welcomed by producers and presenters within those areas and is seen as a success. This inclusive approach could be built on further. To do so should be a priority for those concerned with maximising the efficiency and outreach of BBC science. One suggestion made by several of those interviewed was that there might be a Corporation-wide Science Adviser – in analogy to the Government’s Chief Scientific Adviser (and to the equivalent in every Government Department apart from the Treasury) – to give an objective view of the world of science and to coordinate activities over all BBC platforms. To maintain or improve its reputation for quality, accuracy and impartiality in this area the Corporation needs to consider whether the flow of scientific information within its own walls is as effective as it should be.

ACCURACY AND LEVEL OF BBC SCIENCE OUTPUT

One of the terms of reference of this Report is “accuracy”. With the exception of minor errors, usually corrected, there seems in general to be no real issue with accuracy in the features treatment of science on either television or radio. In news and current affairs and in web coverage and phone-ins these matters are not always so rosy but I return to that later.

Another frequent external claim is that of “dumbing down”. Much of this comes from those who pine for the days of Raymond Baxter. Others may dislike the modern format of *Horizon*, which – as the Content Analysis points out – has moved to a narrative format in which a story is shown to unfold, rather than the straight exposition that once marked most science documentaries. This is a change in style, rather than content, and there were few complaints from those I spoke to about over-simplification; instead, many congratulated the Corporation on its ability to attract the attention of a range of audiences from children to professionals. Several positive comments were made about the depth of specialist documentaries on BBC Four, with congratulations on, for example, the recent series on statistics, *The Joy of Stats*. In general the BBC passes the test of reporting science in the “clear and precise language” referred to in the Terms of Reference.

There was also justified praise for the ability to insinuate the subject into programmes that are not overtly scientific: *Springwatch*, *Coast*, *In our Time*, and *Jimmy’s Food Factory* were mentioned. The few comments on over-simplification came from scientists themselves, and almost always referred to their own specialisation – mathematicians complained that maths programmes were too simple (although I found the famous *Horizon* on Fermat’s Last Theorem entirely baffling), chemists said the same of chemistry, and so on. I grind my teeth when I hear the phrase “scientists find the gene for”, but this no doubt is my own prejudice. *Horizon* itself was sometimes accused of having declined in sophistication (rather than style) since its early days, but – if true – there was an acceptance that the process has now been reversed. Science on Radio 4 is generally agreed to have been a great success, with particular praise for the *Material World* strand, which treats subjects in more depth than does TV, unencumbered as it is by the need for

pictures. News, particularly radio news, often finds quirky stories that catch a listener's imagination: on the day when I put the finishing touches to the first draft of this Review, the *Today* programme had clear and engaged accounts of how a flea jumps and of why it is less painful to stick a pin into one's hand if it is made to look smaller under a lens – a discovery important to those who try to sort out the subjective and objective elements of pain.

As discussed in an earlier section, some BBC channels have little input into the subject. Perhaps, given the youthful audience of Radios 1 and 2 and of BBC Three some effort should go towards increasing coverage there in order to meet the “audience expectation” mentioned in the Terms of Reference and further to broaden the audience for science. Radio 3, too, with its unabashed appeal to the intellect, might find more room for the topic.

HOW DEEPLY DOES THE BBC PENETRATE THE WORLD OF SCIENCE?

Communication is an essential part of science, but to those within the profession to communicate with their peers is far more important than is engagement with the public. If a piece of research, however impressive, has not been fully revealed, it has – in effect – not been done (as Fermat's last theorem showed). At the centre of the process is peer review: a manuscript is sent for comments to external (and supposedly objective) experts who comment upon it and insist where necessary that it be revised or (very often) rejected. This process has its faults and is no guarantee that errors (even glaring ones) will be identified by the experts conducting the review. Even so, as Churchill said of democracy, it is the least bad of all the systems that have been tried from time to time. The BBC appears to be aware of the process, although perhaps (as in MMR) takes its endorsement rather too seriously: plenty of rubbish is published after passing through the system. Peer review is a necessary consideration when making editorial decisions, but is not the only one.

I discuss here the Corporation's access to the forum of information interchange within science and its relation to the wider issue of the diffusion of scientific information to the public. In general the BBC does well at the latter task as it reports on the scientific stories that come its way. There is, though, a considerable gap in its insight into the former. At its

worst this could lead to a form of bias through failure to inform. The stream from which the BBC fishes its facts is a trickle compared to the torrent of data available to those who know where to look. To describe St Paul's Cathedral without mention of the presence of a dome would not be seen as showing due impartiality to architects. The present gaps in science coverage may equally provide an audience with an incomplete and hence less than objective view of what is actually taking place in the scientific universe.

The technical literature is huge. The main electronic data base of research publications contains about forty million items, added to at a rate of two a minute, twenty four hours a day, three hundred and sixty five days a year. One recent estimate is that there exist 23,750 scientific journals. Many are in obscure languages or are of interest to only a few specialists. Even so, active outlets of information are counted in the many thousands and far outnumber those in politics, sport, education, the arts or any other endeavour.

The ecology of this factual jungle is complicated, obscure and little understood outside the profession itself. Nearly all results are published in specialist journals. The BBC does use a few of them to access information but most of this huge mass of data is ignored by its journalists, either because they are unaware of its existence or because they cannot gain access to it. As a result, news coverage of science – in the media as a whole and not just the BBC – tends to be reactive rather than proactive; it responds to material passed to it by a few major publications, by universities and by charities and commercial organisations rather than searching for stories of its own. That dependence on feeding rather than hunting is revealed by the Content Analysis. It shows that three quarters of BBC broadcast news items about research (which make up half the items picked up during the relevant period) appeared to be associated with press releases (although it is just possible that some of this PR activity was a response to BBC reports rather than the other way around). Only ten research stories (about one in eight of all broadcast news items about research) did not appear to arise from public relations activities.

The BBC does, of course, pick up stories of its own. A scan of the broadsheet press suggests that the Corporation does considerably better in original investigation of science stories than do most newspapers. In addition, it also comments on material picked up through such channels rather than (as the papers often do) simply reporting them

verbatim. Even so, it is hard to deny the central role of public relations activity in BBC science reporting. Such a dependence on secondary sources raises the risk of what has been called “churnalism” (a term invented by a BBC journalist): simply transmitting output from places that may have an undeclared bias of their own. As a 2009 *Nature* editorial put it: “society needs to see science scrutinized as well as regurgitated if it is to give science its trust” and it is not clear that the limited pool of information used by News enables it fully to meet that requirement.

The world of the scientific press release has – of course – real strengths. The British Antarctic Survey has analysed three thousand media pieces that mentioned its work in 2009. Seven out of every ten among them – roughly the same proportion as that in BBC News – emerged from its own press releases, which had 30,000 hits when placed on their website. Many such documents are objective and straightforward. Organisations such as the Science Media Centre, EurekAlert, AlphaGalileo, the British Science Association and more provide them on a more or less *pro bono* basis. Others produce them to publicise their own journals – the Royal Society, *Nature*, *The Lancet* and others – or their funded research (the Wellcome Trust, the Research Councils, most British universities).

Even so, they are not part of the internal discourse of science and their uncritical use by the media can cause problems. Some examples are egregious. The Content Analysis draws attention to one hour-long, prime-time and heavily puffed BBC One programme – *The Link* – in which the agenda appears to have been set almost entirely in accordance with an orchestrated plan; event the documentary, an almost simultaneous book publication, a website and an exhibition of the fossil, all of which led to ecstatic press coverage. The claim was of a major missing link: a fossil of the earliest human ancestor. In spite of the publicity the story was already marked by doubts within the scientific community about its validity. I was myself asked to write a book based on it – but only if I signed a non-disclosure agreement, which I refused to do). A *Guardian* blog by the science journalist Adam Rutherford (one of those interviewed for this Review) revealed that the publicity storm and television schedule was planned even before the paper was written. In May 2009 the *New York Times* described the public relations exercise as “science for the Mediocene age” and one of the authors of the paper agreed: “Any pop band is doing the same thing, any athlete is doing the same thing. We have to start

thinking the same way in science.” The BBC would not swallow that from a pop band or an athlete, but it did from a fossil; it was advertised by the Corporation as “a ground-breaking discovery that could be the most important for centuries”. In fact the result was widely challenged almost at once.

There remains in my view an over-dependence upon the obvious sources, press-releases included, which means that the media as a whole pluck the low-hanging fruit: they swallow the same stories. This leads to duplication: on any day, one sees the same items in the broadsheets, on radio and television news, and on the web. In late 2010, for example, a piece about the UCL neuroscientist Beau Lotto and his work on bee behaviour, carried out with the help of primary school children, featured on several BBC news outlets and in a number of newspapers. At much the same time and in much the same way an item about the implantation of a sensory chip into the human retina also appeared in a variety of places. These are interesting enough, but neither can be described as startling; and their widespread diffusion at the expense of other items marks a failure to penetrate beneath the skin of science by the media as a whole. The BBC has so much science expertise and so many direct contacts with scientists (particularly in its features strands) that it should in its news coverage aim to be relatively less dependent on reaction to information than are its competitors. It has the resources to dig deeper into the scientific literature and should strive to do so.

Over-dependence on news offered by external organisations means that there may be rather little questioning of what is presented. As the Content Analysis makes clear, only a minority of the broadcast news items about research that came from a press release introduced a comment by independent scientists: around one in four had another voice, but most spoke only to the scientist put forward in the release. Even when journals are named in a broadcast item their range is remarkably restricted; one might not expect full coverage of the thousands of outlets but it was a surprise to learn that, at least during the period of observation by the Imperial College team, broadcast news depended on so few. In non-medical items, just seven named an original paper – five refer to *Nature* and two to the *Proceedings of the National Academy of Sciences*. Medical reports referred to a wider set of publications but, even so, almost nine in ten in the sample came from the *British Medical Journal* and *The Lancet*. Dependence on such a narrow base does not

speak well of BBC news journalism. The irony is that so many more untapped resources are available in science than anywhere else. It would not be hard to find them, nor to discover unreported controversies, if only the BBC knew where to look. There are several possibilities.

Personal Contact with Scientists

Many science stories involve talking to scientists. The sections responsible for the subject within the BBC each have their own lists of contacts, some extensive. The BBC has a real reservoir of goodwill within the academic community. Features programmes on both radio and television depend heavily on such personal interactions, built up over many years. Radio, in particular, has an impressive list (although Television Science, News, and Current Affairs work largely to their own, independent, set of sources). Something would be gained if the contact books of the various branches of the organisation were held in common.

Another potential source of new results is the scientific conference. There are hundreds each year. Most are too specialist (and too boring) to be useful, but some of the huge neuroscience, chemistry, genetics, or ecology meetings merit attention, particularly when they are held in the UK. The BBC attended just seven in 2010 – but it almost always sends people to the British Science Association meeting, or the American Association for the Advancement of Science equivalent (for the latter there are usually more British reporters than locals). Perhaps a better balance of investment across a wider range of meetings would give a wider view.

The Hidden Keys to the World of Science

Time pressure on news and even on features means that the resources available to producers in their search for novel material are limited. It seems odd, then, that the Corporation fails to use the tools that would make this process so much easier.

There has been a revolution in the world of science publication. In response to the rising subscription costs of the technical journals and the charges made to those who publish in them, a new world of electronic publishing has emerged. Online journals such as the Public Library of Science¹² are freely available and cover their costs by charging granting

authorities for publication. They contain many excellent papers – but are almost never consulted by non-scientists. Another outlet is the Digital Object Identifier (DOI) system¹³, which gives a unique identity to every publication. This allows researchers to display work in expensive journals by placing them on their web pages. Once again, this resource is rarely accessed.

The biggest gap comes from a failure to use the mass of material available in digital form. Within science itself, electronic tools are now essential. Google Scholar¹⁴ combs the accessible (but not the commercial) literature and does something to explore the knowledge base. Although it has on occasion been criticised for missing information and not being up to date, and is sometimes accused of being full of errors, it can be useful. It seems scarcely to be utilised by BBC journalists.

More unexpected is their ignorance of the two powerful scientific search engines, the Web of Science and the (newer) Scopus system^{15, 16}. These have revolutionised the flow of information among scientists themselves and have, in effect, replaced every library. They give instant access to all important journals – for the Web of Science 12,000 at the last count. Each journal is instantly searchable, every paper is linked to others cited in its own literature, and to later papers that mention it (which makes it possible to go at once to the cutting edge of any field). Many results appear before formal publication.

The Web of Science allows information to be accessed in many ways. Each month it identifies the most cited papers in a particular area and provides an overview of the growing points of science. In December 2010, for example, there was an outburst of interest in what makes cells symmetrical, in randomness in marine ecosystems, in false paternity in wild animals, in the ancient roots of the Australian continent, in the genesis of bone, in the importance of gut bacteria to health, in the planned death of nerve cells, in the physics of thin films, in the chemistry of the Sun, and more. Many of these are of little interest to a general audience – but some might be. In addition, this electronic gateway makes it possible to check which fields are most active from one week to the next. Searches can be made for rising stars, for new papers most cited by others, for classic publications, for changes in national output (China is in a phase of explosive growth) and more – and a complete coverage of science demands at least some

consideration of all this information. To ignore all this through editorial decision is acceptable, to fail to give due coverage to such topics through ignorance of their existence is not.

The Web of Science is owned by Thomson Reuters. It is an addiction for nearly all in the profession and for many scientists scarcely a day passes without it being consulted. The most unanticipated finding I made during this entire exercise was that I was able to discover only one person within the BBC (unsurprisingly, from the Radio Science Unit) who had even heard of the system, let alone used it. For an organisation devoted to reporting scientific information this is startling. It is equivalent to covering politics without knowing of the existence of *Hansard*.

A failure to inform?

For the BBC to exclude itself from the main forum of discourse narrows the database available for science reporting and may lead to other subtle forms of incompleteness. As the Content Analysis notes, 80% of the universities named in television and radio news stories about science during its survey were in the UK. It notes in addition a remarkable lack of reference to work published during its survey period in the American journal *Science*, widely accepted to be (with the London-based *Nature*) the most important journal of all. For a British organisation to emphasise our own national efforts may be expected, but given that our contribution, eminent though it is, marks just a tenth of the global output the Corporation is again showing a certain failure to cover the whole field here.

Analysis of the data within the Web of Science gives other insights relevant to the BBC's mission to give a full and objective account of the world. It can be used to estimate the relative size of various specialisations and hence makes it possible to compare the shape of the scientific endeavour with the distribution of topics covered by the broadcast media. The diagram below shows the relative size, and the degree of interconnection, of many sciences on a global scale¹⁷.

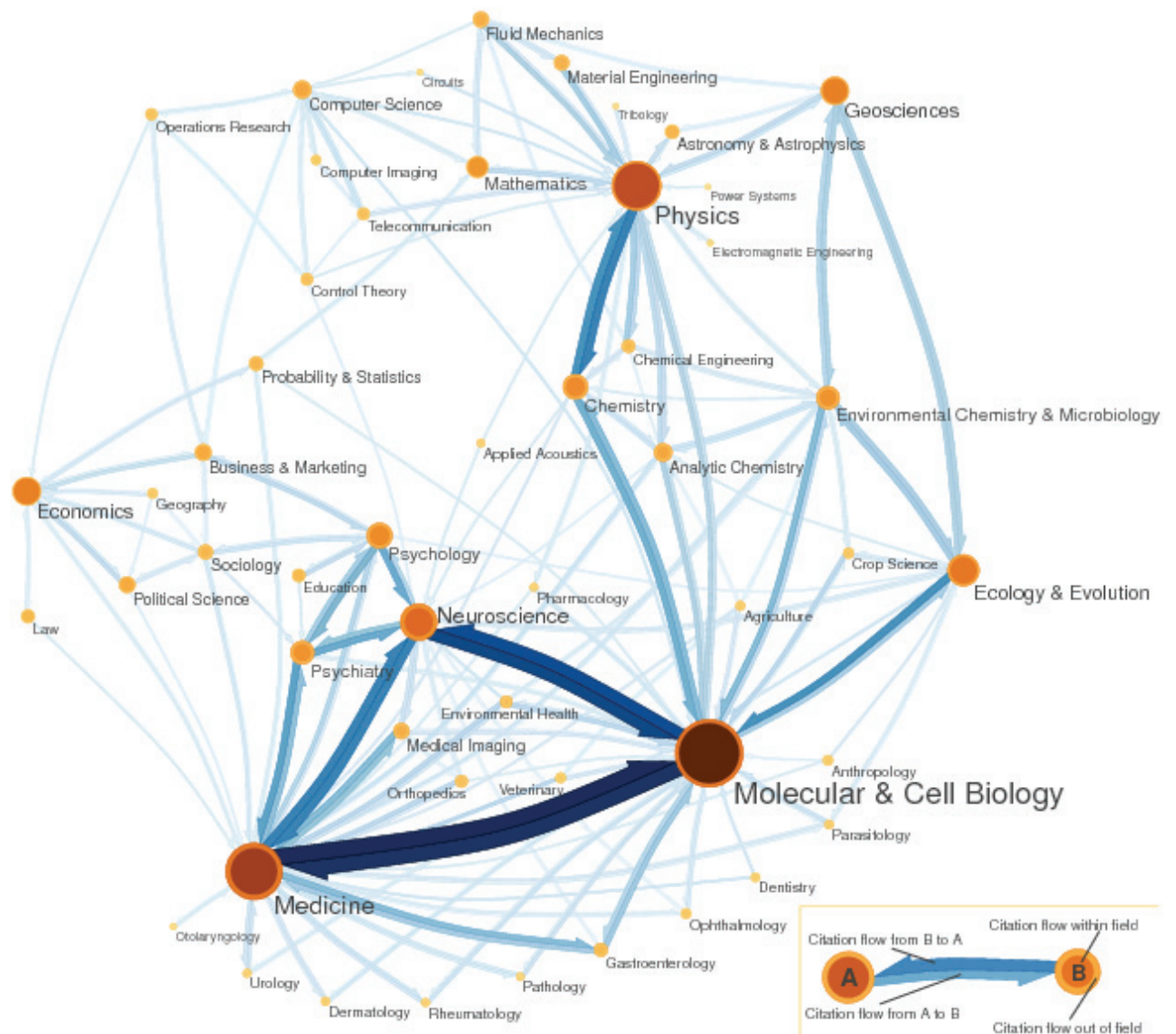


Fig. 3 The Map of Science: The Size of Each Field, and Who Refers to Whom

This image reveals a disconnection between what is presented by the BBC and what is potentially available. The largest and most interactive topic of all, Molecular and Cell Biology, has ties with medicine, with neuroscience, with ecology, with chemistry, with computer science, and more. Much smaller and more isolated are astronomy, anthropology, and geosciences.

Relatively minor as they may be, those three have a prime position on television, with whole series, from *Men of Rock* to *Secrets of the Solar System* and *Human Planet* devoted to them. Ecology and evolution are only slightly larger – but they too are lavishly treated with, in effect, a whole Natural History Unit to cover them, either explicitly (*First Life*) or implicitly (*Springwatch*). One would not expect a non-visual topic such as molecular

biology to attract as much attention as those offering images from volcanoes or from the outer planets, of Amur tigers or the shark-hunters of the high Arctic, but the contrast between its relative weight in the world of science compared to what is reported about it is notable. As a result, the vast investment by the taxpayer in molecular and cell biology is (with the exception of a few excellent programmes such as *The Cell*, which gained a tiny audience on BBC Four) hardly reflected in documentary coverage. The same is true of chemistry, computer science and more, all of which have a substantial presence in the research literature but scarcely feature on air. The shift in emphasis between science as a whole, as manifest in topics listed on the main scientific database, the Web of Science (WOS), and in the news and non-news coverage of the period scanned by the Content Analysis is summarised below:

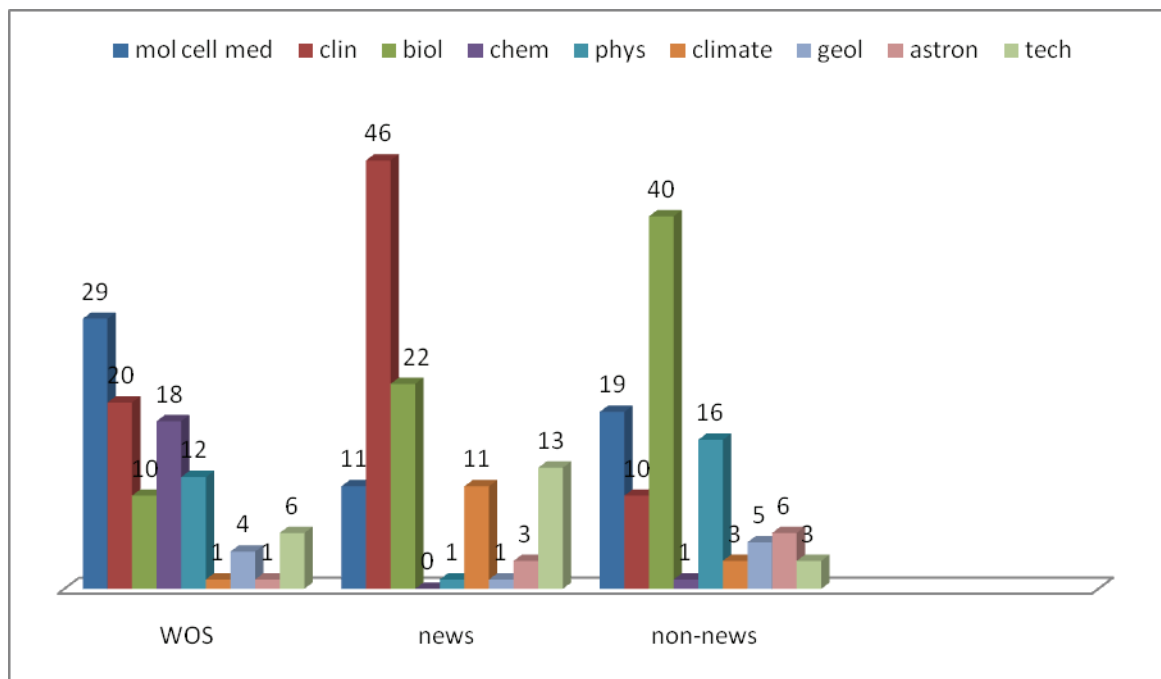


Fig. 4 Comparison of Coverage by Topic

The height of the bars, and the figures above them, are proportions of each of the topics, in turn molecular, cellular and basic medical sciences; clinical research; general biology; chemistry; physics; climate; geology; astronomy; and technology. The categories are crude, particularly where trying to delineate health advice (such as that dealing with the swine flu epidemic) from clinical research. There are also weaknesses in the data on broadcast output for they covered only the survey period for the Content Analysis, which

was biased on the news side towards swine flu and climate change, the former, if not the latter, rather a one-off in overall treatment of scientific issues. A fuller analysis of a broader range of programming and a longer period might paint a somewhat different picture.

Even so, there are some real contrasts between the three sources of information. News, and to a lesser extent features coverage of science, has a shortage of basic molecular, cellular and medical research, while news has a great excess of clinical reports. Basic biology (ecology, evolution, animal behaviour and the rest) does well in non-news whereas chemistry does disastrously in both outputs although physics does quite well in non-news but is almost absent from news. Climate, which has only a minor presence in the science literature as a whole, is heavily over-represented in news coverage.

There is also a tendency to “clinicalise” fundamental discoveries in biology. Stem cells, the human genome project, and the positron emission tomography scanner have told us many things about how the body works, but so far have had very little impact on health care. In the 1950s there were confident predictions that all infectious disease would soon be defeated thanks to antibiotics; a prediction, alas, that was far from the mark. To listen to the optimistic spin sometimes put on the relevance to disease of today’s fundamental science, much of which is in its infancy, is to be in danger of falling into the same over-optimism. Tom Feilden’s *Today* report (15th September 2010) on a particular drug targeted at a skin cancer was balanced and cautious, but even he allowed himself to use the slogan, put out by those who funded the work, that this was a “penicillin moment” for cancer. It was not.

Even medical research itself, the second largest element of the research world (and one of particular interest to the public), does not find its proportionate place on air. Much broadcast interest is health-related rather than covering basic research, which is surprisingly under-represented in the non-news arena. Medical dramas such as *Doctors*, *Casualty*, *Holby City* and *Nurse Jackie*, with their emphasis on new treatments, occupy far more air-time (and far more of the budget) than do programmes dealing with the science that produced them. News pays more attention to medical sciences and technologies for they represent, according to the Content Analysis, around half the science-related items

broadcast.

Whatever the issues of quantity, the coverage of medical matters in a non-news format is of high quality, although it has an unexpected tendency to look backwards. Radio 4's 26-part series *The Making of Modern Medicine* was a *tour de force* of the history of medicine. The same was true of Michael Mosley's 2008 four-parter on BBC Four, *Medical Mavericks* although his recent documentary *Pleasure and Pain* did give an up-to-date account of research in one aspect of medicine, as a complement to his (again historical) BBC Four series *The Brain, a Secret History*. Mosley's contribution to the science slots on the popular *One Show* do mention recent biomedical discoveries. A sideways, or even a forward, look at what is happening today might widen the treatment of medical research.

Cancer provides a microcosm of how an incomplete exploration of information can lead to partial coverage. A survey of more than a thousand cancer research stories on the BBC web archive from 1998 to 2006 – which probably mirrors overall BBC reporting of this topic – shows a marked over-representation of breast cancer reports over others while lung cancer – which causes one-fifth of all cancer morbidity and mortality – was mentioned far less than its disease burden merits¹⁸. This is undesirable, for women over-estimate their risk of breast cancer, while smokers have an unduly optimistic view of the chances of escaping cancer of the lung. Again, three journals – *The Lancet*, *British Journal of Cancer*, and *British Medical Journal* – were over-utilised as sources relative to their presence in the literature. British research was cited six times more often than reflected in its global impact. Mental disorder – which represents a quarter of the burden of disease in the UK – is less discussed by the BBC than is cancer (although – judged by its disease burden – cancer might merit only about half the numbers of items as does mental illness). Within the mental disorder field, the cost of treatment of Alzheimer's disease is only about half that of depression – but it has almost three times the BBC cover. Over three months in 2007 and 2008, the BBC's web-based items on the latter topic received eight times the number of hits as did those on Alzheimer's; a further indication that coverage does not always reflect a disease's real importance.

It would be foolish to suggest that the BBC's treatment of scientific matters should reflect the complete pattern of global research or that producers should constantly scan the

technical literature to find new themes. I was told by several of those involved that it was not the Corporation's job to educate the public across the whole field, but to generate interest that some might wish to take further of their own accord. I agree, but the disjunction between the real output of science and of its image as presented by the Corporation is worth consideration when assessing its attempts to present an impartial face.

SCIENCE AND POLICY

This Report is enjoined to assess the BBC's coverage of this subject as it relates to public policy and to political controversy. The economic importance of science makes it clear how central an issue this is, while the dependence of research on government funding brings it into the political arena. Many policies have a scientific element. They include education, energy, transport and health. To reflect its importance, all government departments (apart from the Treasury) have a Scientific Adviser.

The Research Councils UK's 2008 Report on science and the media found that three quarters of the people polled felt that scientists "should discuss research and its social and ethical implications with the general public". Two thirds of the population thinks that the government puts too little effort into bringing together science and policy-makers, a third feel that the speed of development in science and technology means that it cannot properly be controlled by politicians, and half believe that the public is insufficiently involved in what is decided about those subjects. Items on science and policy would find an audience.

As the Content Analysis makes clear, these issues are usually treated as separate items. Science is rarely considered in social context (although it is fair to point out that *Newsnight* is among the top three programmes in the proportion of output devoted to science, sometimes with a societal flavour; and that one of its four specialist editors is a science editor even if that is not reflected in coverage). The Corporation may be missing some opportunities to take a fair and balanced look at political matters in this context. Its discussion programmes such as *Question Time* invite a great variety of panellists from politics, the media, sport, the arts and more. In the past five years there has been but one guest scientist on *Question Time*; and Lord Winston, the distinguished individual involved, is as well known as a public figure as a practising scientist.

Quite often, policy emerges directly from science. The plan to cull badgers in Wales and not in England turns on disagreements about the epidemiology of bovine tuberculosis, but broadcast coverage has concentrated on the views of farmers or of animal activists rather than on the technical aspects of transmission of the disease. In the same way, controversies about whaling have a strong scientific element (not least the Japanese

claim to be assessing population numbers in its annual cull) but the science is covered much less than are battles between conservationists and harpooners. To consider, in the same piece, some of the facts behind the political issues would add depth to both sides of the argument. In the same way, the vexed matter of what to do about climate change (considered in more detail later) has implications that could be illuminated by the latest research, from the effectiveness of carbon quotas to the efficacy of green energy.

As the Content Analysis notes, in only one science news item in fifty was there a UK governmental statement that referred to policy. The Gulf oil spill – an event illuminated by geology, engineering and more – was taken mainly as a fast-moving news story. It should be said, though, that there was much praise for the treatment of the H1N1 influenza epidemic, in which its biological, medical and social implications were treated in a balanced manner in news coverage and at more length in programmes such as *Newsnight*.

Science policy – funding most of all – is an important issue in its own right and it is notable that although *Newsnight* gave the Coalition's first Budget a full treatment, its effects on science funding, and a demonstration by scientists (which, unusually, had some effect on a political decision) were scarcely mentioned. The recent changes in public expenditure and in education and immigration will also influence the activities of science but news reports have tended to ignore this. Given the readiness to speak out of politicians responsible for defence, for the economy, for transport, for health and the like, the low public profile of the masters of British science – of whatever party – is unexpected. Perhaps those within BBC Science could involve themselves more in social and political aspects by collaborating with colleagues responsible for political and economic coverage.

The Content Analysis points out that there is little attempt to treat science as a cultural activity, nor to consider the social implications of particular discoveries (scientists themselves may suffer less regret at the low profile given to the sociology of science). Such strands might help give a more complete and accurate description of its world. It also picks up a more subtle point: the cool and emotionless treatment of many reports. Science is as full of hope and despair as any other endeavour and an occasional attempt

to give it a human face might help persuade the public that it does have an impact on their lives.

DUE IMPARTIALITY IN SCIENCE BROADCASTING: THE SAME GUIDELINES AS IN RELIGION, ARTS, HISTORY, DOCUMENTARIES, NATURAL HISTORY, DRAMA, COMEDY, LIGHT ENTERTAINMENT, SPORT, LIVE EVENTS, EDUCATION AND MUSIC?

In 1904 the President of the Royal Society advised British physicists to give up their subject as everything worth knowing had been discovered: Newton's laws worked on every scale from atom to universe, and we understood electricity, magnetism, heat and light. It was time to move on and study something more interesting. Twelve months later, classical physics collapsed as a general explanation of the world around us, for relativity and quantum mechanics had destroyed its foundations, at least where the structure of matter and of the universe itself was concerned. In science, that shows the expert is sometimes wrong and the received view is not always to be relied on. Mavericks do sometimes deserve their say and had the BBC been around in those days it would, no doubt, have presented both sides of the argument as evenly as it could and, once agreement had been reached, have moved on.

A century later the Corporation seems to find it hard to do that. The problem comes, in part, from a difficulty in understanding the nature of scientific debate. In particular there are divergent views within its ranks of the meaning of due impartiality – a central element of this Review – when it comes to science. How the subject is reported can lead to disagreement: at the 2009 World Conference of Science Journalism the then Minister for Science and Innovation Lord Drayson praised British science journalists as “among the best in the world” at “speaking truth to society about science”. In the same room shortly afterwards the author of the best-seller *Bad Science* Ben Goldacre referred to his audience as “murderers with blood on their hands”.

Faced with such opinions, how “due impartiality” is defined has a crucial effect on how the concept should be applied. The BBC has long had guidelines in this area and, over recent years, the Governors and their successors, the BBC Trust, have put much effort into establishing and formalising these. One important move toward this end was, in 2007, to publish a report entitled *From Seesaw to Wagon Wheel: Safeguarding Impartiality in the 21st Century*. As its author, John Bridcut, phrased it, after extensive discussions with interested parties inside and outside the BBC: “Impartiality involves a

mixture of accuracy, balance, context, distance, evenhandedness, fairness, objectivity, open-mindedness, rigour, self-awareness, transparency and truth.” These are fine words but each is open to interpretation and as the document itself says of its central theme: “the way it is applied and assessed will vary in different genres”. The word “science” itself appears only once in his paper, as one of the fields – Science, Religion, Arts, History, Documentaries, Natural History, Drama, Children’s Programmes, Comedy, Light Entertainment, Sport, Live Events, Education and Music – to which “Impartiality” must be seen to apply (although it does in addition make some direct reference to climate change).

It is not within my remit to comment upon the Editorial Guidelines themselves, and I do not propose to do so. But can the term really have the same meaning when applied to such divergent topics? The concept certainly accepts that the level of judgment applied depends on the subject under discussion, on the target audience and on other issues. Sometimes, its usage is fairly loose: an account of an election is more open to scrutiny than is a programme on how to grow asparagus and the commentary in an England World Cup match is scarcely “distanced” from its audience. Again, the new concept in the revised Editorial Guidelines of seeking to achieve “due weight” in the way opinions and perspectives are covered may help to resolve this but as yet no evidence has emerged.

As the Content Analysis makes clear, much of the coverage of scientific matters is scarcely involved with matters of partiality, for they are simple factual reports, most of them presented with a neutral approach. Smaller numbers are given a mildly optimistic tone, and an even smaller proportion reaching a rather pessimistic conclusion. Science correspondents, in general, make few critical comments about particular items and whole series such as *Bang Goes the Theory* present their material in a light-hearted and straightforward manner that does not often enter into areas of controversy. Some might suggest that even a little more scepticism and questioning – essential as each is to the practice of science – might enter such general science reporting.

In a minority of cases, though, more difficult issues of balance have arisen. Often, they involve the interaction of science with health or with government policy. These

sometimes contentious items have led to much comment from those contributing to this report. There appeared to be some disagreement as to quite how, in such discussions, balance should be struck. One problem may be the plethora of definitions that surround the issue. Even after having spoken at length to numbers of BBC personnel (and having received the agreement of several senior members of staff that my Report accurately reflects our discussions on the subject) I still find it hard to understand how the Corporation uses its various criteria. The distinction to be made between “consensus”, “received wisdom” and “impartiality that is adequate and appropriate”; between “balance”, “due weight” and “due impartiality”, and quite who decides what constitutes a “controversial subject” and – when it comes to science – on what grounds they make the decision is not entirely obvious to me nor, perhaps, to some within the BBC. This may be due to my own obtuseness, but it is clear that, outside the Corporation, there is widespread concern that its reporting of science sometimes gives an unbalanced view of particular issues because of its insistence on bringing in dissident voices into what are in effect settled debates.

This point has been made in earlier reports, was repeated in several of the documents submitted to me by the outside organisations from which I solicited responses, and by numbers of those to whom I spoke. Some of those associated with editorial policy within the BBC felt that its new guidelines, with their emphasis on giving due weight to opinions and perspectives as part of due impartiality were now sufficiently flexible to deal with this issue and that, as they accept the need for more than a simple balance between opposing viewpoints, there should be no cause for conflict when considering science. This may perhaps be correct and if the guidelines are followed in the spirit in which they have been issued things may improve. All I can do here is report what I heard during this review: that there is widespread concern within the scientific community that in News and Current Affairs undue attention is given, when certain subjects are discussed, to oppositional views of received results. The community may be wrong in that interpretation but at the least there is a disconnection between the reporters of science and those whose work is reported. It would be a mistake, in the chorus of praise for the elegance of the BBC’s guidelines and the theological intensity of the discussions about what they actually mean to ignore the disquiet of many of those exposed to them.

To identify impartiality is a particular difficulty when it comes to science, for that field, unlike any other, claims to present objective, tested, and accepted truth. Most of the time, it does; and without a widespread acceptance of that agenda science could not progress. Often, there is little reason to dispute its assertions: the world is not flat, life is not six thousand years old, carbon dioxide levels are rising through human activity and smoking does cause lung cancer. Millions choose to disagree with each of those statements but within the world of science there is almost no difference of opinion about any of them, nor for most of the corpus of physics, chemistry, biology and the rest. In most areas of endeavour, the famous “wagon wheel” involves the presentation of divergent opinions; but science deals, most of the time, with opposed evidence. To confuse the two can destroy the whole basis of impartiality.

As many of my interviewees said, in a diversity of ways, that process demands, above all, equality of voice: the acceptance that disagreement must be among those with at least some understanding of the nature of debate. Within science, there can be a divergence of view about the interpretation, or even the accuracy, of a piece of research. Sometimes, that spills over into personal dislike. Even so, every scientist, perhaps without realising it, accepts Cromwell’s entreaty that “in the bowels of Christ, think it possible you may be mistaken”; they are, when faced with evidence, and however reluctantly, willing to change their minds. That ruling does not apply to many other fields, from politics to the arts or to sport where immovable and contradictory opinion is widespread and even welcome. For science, in contrast, for most of the time, and in most of the subject, there is a wide acceptance of a body of scrutinised fact, interrupted by rare moments when ideas change. Constantly to call in external voices unwilling to accept that principle is not to engage in debate but in meaningless polemic.

Journalists (or most of them) wish to report what they see as the truth. If there are opposing views about some political or artistic issue, they may seek a balance by presenting an account that lies somewhere between the two extremes. This is not the same as impartiality, which involves a refusal to favour one point of view, particularly where politics is involved. In science reporting, though, balance and impartiality seem often to be conflated. When faced with strongly opposed views in a scientific discussion a journalist may not be certain of the facts presented by each side and may apply balance

while describing it as impartiality – but if one proponent is presenting dubious evidence that claim is not justified.

As some within the world of broadcasting perhaps fail to realise, impartiality checks are built in to the scientific enterprise. The objectivity of researchers is judged as they undergo a series of painful processes from the successful grant application, to endless discussion within a group as to the validity of a result, to a journal's peer review before a piece of work becomes public and then, quite often, to the presentation of contrary views in the scientific literature. Many of those put up in opposition to a scientist on the broadcast media have had, in contrast, no scrutiny at all of the claims they put forward. A certain amount of emphasis might be placed on the differential examination that the ideas of each party have undergone when considering the need for due impartiality.

Scientists: Truthful or Dishonest?

Science certainly involves disagreement; it could not progress without it. Scientists may be biased, and they have no shortage of prejudice, over-confidence, self-delusion, carelessness, jealousy and personal loathing. However, much though they may deceive themselves about the value of their own work they rarely tell lies to each other or to the public.

Rarely does not mean never. Scientists do not belong to a priesthood (although some might disagree). Fraud exists. Sometimes it is egregious, as in the case of the American immunologist who claimed to be able to transplant a patch of skin from a black mouse to a genetically distinct white individual (he used a marker pen). To some extent these hoaxes are self-correcting because the results cannot be confirmed but no doubt some have found their way into the literature. More often, a modest piece of work is over-promoted, as in the repeated promises that gene therapy is just around the corner (where most of it still is) although such hype pales by comparison with the claims made, for example, by alternative medicine. An undue proportion of such delusions emerge from medical research, where there is a natural desire by researchers and patients for a positive result. Journalism plays an important part in revealing the true state of affairs and the BBC has itself succeeded in exposing excessive claims for certain drugs and for medical (or quasi-medical) treatments.

There have also been cases in which dubious science has been promoted by those with a financial interest: the denial by researchers hired by the tobacco lobby that smoking causes lung cancer is notorious. More recently it has been shown that those funded by pharmaceutical companies tend to give more favourable accounts of a drug than do those whose grants come from independent sources²⁰. There are hence some cases in which editorial discretion is needed in, for example, naming the source of funds; more often, perhaps, when claims are made of some immediate medical or technological advance. It is worth remembering, though, that almost all British research in – say – theoretical physics, or evolution, or marine biology is funded directly by the tax-payer and it is surely not mandatory that, in the interests of impartiality, the precise source of support be pointed out each time a news item mentions such work. The Content Analysis shows that often they are not but this seems to me not a major issue.

Financially driven or otherwise, bias, fraud and self-delusion are uncommon in science. To listen to some of the BBC's coverage would be to doubt that statement. Although much of it is excellent, again and again news and current affairs return to the sub-text that the correct way to treat a scientist on air is as if he or she were a politician: someone whose devotion to the truth is determined by a pre-existing agenda. Generally speaking – and in spite of frequent accusations by those opposed to particular findings – this is not the case. Exaggerated, financially compromised, or overtly dishonest work should always be open to question; but science is not intrinsically, as elements of the media sometimes imply, a shady pastime awaiting exposure by the bright beam of reportorial truth.

Confrontation versus Debate

The single most consistent and repeated theme in my discussions with scientists – and with some, but not all non-scientists – and the most frequent complaint in letters from scientific societies has been that an insistence on oppositional treatment of a science story may sometimes pervert the whole dialogue: as one internal source put it “the BBC can deal with anything except consensus”. Such bogus impartiality (mathematician discovers that $2 + 2 = 4$; spokesperson for Duodecimal Liberation Front insists that $2 + 2 = 5$, presenter sums up that “ $2 + 2 =$ something like 4.5 but the debate goes on”) can, perversely, lead to bias in its own right, for it gives disproportionate weight to minority

views – and some of the minorities involved are expert in taking advantage of the platform offered.

This point about false balance has often been made before, from the 2000 House of Lords Select Committee Report⁴, which criticised the tendency to pay undue attention to contrarian views “simply because confrontation makes good copy” to the 2010 Science and the Media paper² that claimed that “applying the adversarial model to science stories has led to seriously misleading reporting”. Many other such statements have come from scientists and journalists over the past decade. The issue remains a real matter of contention within the profession. Disagreement, scepticism and questioning are the life-blood both of science and of serious journalism; unthinking opposition is not.

Brian Cox in his December 2010 Wheldon Lecture *Science: a Challenge to TV Orthodoxy* made the point well: he had described, in an off-hand comment during his *Wonders of the Solar System* series that “despite the fact that astrology is a load of rubbish, Jupiter can in fact, have a profound influence on our planet. And it’s through a force ... gravity”. Cox’s comment, he went on to tell us, led to complaints by viewers. One, as recorded on the BBC website, was that Professor Cox’s comments were “gratuitous” and made without an “alternative opinion ... being allowed”. The complainant said “... at no point did it [the programme] or was it [the subject] intended to consider such questions from the perspective of an astrologer, who draws upon a very different body of observation and knowledge built over thousands of years”.

The BBC’s Editorial Complaints Unit responded, quite reasonably, that “His position was clearly that of a scientist exploring the facts behind the natural phenomena of this world and others ... the belief that there is not sufficient evidence to support astrology is one shared by many in the scientific community, who would hold that astrology is a question of belief rather than of science.” The Head of Editorial Standards for the BBC Trust went on to note that the phrase was “colourful”, but that it “met audience expectations with regard to the style and content of the programme”.

Brian Cox made a colourful return to the fray in his Wheldon Lecture, using a different complaint against his comment, posted on Facebook: “His careless assertion was unresearched, unsubstantiated and unscientific. Has he done any empirical studies? Has

he explored his birth chart? ... I have certainly never seen him at an astrology conference or read anything written by him about astrology ... BBC guidelines state that astrology must be presented in a balanced way.”

In response, Cox told us, “The BBC asked me for a statement [from the first, official complaint] – mine was ‘I apologise to the Astrology community for not making myself clear. I should have said that this new age drivel is undermining the very fabric of our civilization.’” He said in his lecture that “This wasn’t issued by the BBC complaints department. Instead, they said that ‘the Professor’s comments were his own, not those of the BBC and were based on his belief that there isn’t sufficient evidence to support astrology’.”

Brian Cox’s irritation at that – shared by many scientists – makes an important point (although he was less than kind to the formal BBC mechanism, which had dismissed the complaint directed to them). It is not the case that astrology is drivel because he, as Professor of Astronomy at Manchester, thinks so. It is drivel because it flies in the face of four centuries of evidence, from Galileo to the latest space probe. To claim, as the BBC appeared to do, that whether or not to believe in astrology is a matter of personal opinion reveals a real lack of self-confidence. At best, such a statement is foolish; at worst it is open to exploitation by cranks.

A frequent comment received during this review is that elements of the BBC – particularly in the area of news and current affairs – does not fully understand the nature of scientific discourse and, as a result, is often guilty of “false impartiality”; of presenting the views of tiny and unqualified minorities as if they have the same weight as the scientific consensus. That approach has for some (but not all) topics become widespread. Conflictual reporting of this kind has the ability to distort public perception. It arises in part because news and current affairs presenters, who have to think on their feet in a live interview, may have little insight into the topic being discussed and hence find it more difficult to establish balance than when dealing with politics, the media or finance.

The MMR issue (the public belief that the use of the vaccine for Measles, Mumps and Rubella could lead to autism) of thirteen years ago is an elderly and familiar example of such a failure in science reporting – and the BBC was far from the worst culprit. It was

driven by a medical panic, exacerbated by a variety of ill-informed campaigns that were given exposure by the BBC and other outlets long after the technical argument was over. According to the Economic and Social Science Research Council survey, at the height of the panic most people felt that because both sides of the argument had been given equal time by the media, then there must have been equal evidence for both (although by then the result had been thoroughly discredited by experts)²¹. An attempt to be impartial had had exactly the opposite result.

That observation has a serious lesson. The most immediate is that the rate of triple vaccination, which fell sharply after the paper was published thirteen years ago, has still not recovered to the levels that would allow “herd immunity”, the protection of a population because so many have become immune that the disease can no longer spread. Not to weigh the potentially disastrous effects of publicising eccentric views in the interests of journalistic enquiry, or to promote them through a natural desire to present a controversial story was, in many people’s view, a failure of editorial standards. In the context of impartiality, the MMR story shows how the media’s attempts to show both sides of an argument can skew public understanding; particularly when a trusted source such as the BBC is involved and most particularly when a matter of crucial medical importance is under consideration.

Many of my interviewees referred to that episode and most insisted that it could never happen again. They are, most of the time, right. The Corporation’s treatment of the influenza epidemic avoided hyperbole (in contrast to that of certain overseas broadcasters who sowed something close to terror). As Professor Dame Sally Davies, Chief Medical Officer, put it in the Department of Health’s response to this Review: “Correspondents such as Fergus Walsh led the media pack. His blog and news packages often framed the national media agenda. His coverage was unbiased, well researched, reflected the nuances of an emerging situation and sought to inform in a reasoned rather than alarmist way.” A potential medical disaster had been averted; and had an epidemic in fact broken out the BBC had the resources, and the talent, in place to inform the public of the forthcoming dangers. A variety of scientific and medical voices was heard, and extreme or contrarian views were notable by their absence.

Today is, in general, to be praised for its cool and well-judged accounts of science or medicine. On 2nd October 2009 it reported on widespread claims in the press that a child's sudden death might be due to the fact that she had, earlier that day, been given a vaccine against the human papilloma virus. The piece was introduced with an unequivocal statement that this notion was dismissed by experts and that the girl had died of a pre-existing heart condition but that press coverage had nevertheless concentrated on the dangers of vaccination. Why was this so? In its investigation the programme interviewed a vaccine contrarian – a general practitioner, Dr Richard Halvorsen, whose forthright views were placed in opposition to those of a specialist in paediatric immunology. The piece was journalistically well-balanced – but one might question whether the interests of balance are more important than the risk that his eloquently stated opinions might have persuaded some parents to deny their daughters protection against cervical cancer. MMR should remind us that in medical matters caution should sometimes take precedence over journalistic inquiry.

Such occasional failures of judgment have, in my view, also been made for other topics even if they do not merit the prudence needed in deciding whether to allow a voice to those who give misleading medical advice. Here is an account of a *Today* piece on genetically modified potatoes, broadcast on 8th June 2010. Tom Feilden is a respected correspondent who gave a clear and impartial introduction in which he interviewed a scientist, Jonathan Jones, in an experimental plot near Norwich. However, back in the studio the Friends of the Earth spokesperson, Kirtana Chandrasekaran (described as a “food campaigner” but with no mention of any scientific background) was allowed to get away with a series of inaccurate statements which took up more time than the researcher or Tom Feilden himself, neither of whom were present. She claimed that GM crops are a risk to health (no convincing evidence, after twenty years of study), that they will contaminate other potato varieties (almost all varieties of commercial potato are grown from tubers rather than seeds; no risk of cross-contamination), that antibiotic [resistance] genes will spread in the environment and cause health problems (impossible; no genes for medically relevant antibiotics in the crop itself but they are widespread in the billions of bacteria we eat, with no harm, each day), that conventional varieties may also have disease or insect resistance (partly true, but the point of GM is to bring them

together), that there are no commercially viable GM crops in the UK (largely because of the activities of the anti-GM movement; there are billions of dollars worth across the globe), that GM is unnecessary and ineffective (why are there a hundred million hectares of such crops?), that they are driving deforestation (the opposite is true with the success of GM soy as animal fodder), that they lead to increased pesticide use (little evidence that this is correct) and that most agricultural research money is devoted to genetic modification (wrong). In the face of these claims the programme simply moved on.

Such mismatched opponents cannot generate balance, which depends, above all, on equality of knowledge by both parties. Sensible debate about GM is certainly possible and quite a lot has been heard on the BBC. Some scientists have concerns that genes might cross (and indeed have crossed) species barriers by hybridization and they could have been interviewed to show that opposition can be based on fact. Certain economists see these crops as a boon for the third world while others believe that they drive peasant farmers out of business, or over-extend the use of patent cover. That too could generate an interesting discussion. One might also ask a health expert to discuss why the British public, unlike that elsewhere, is so resistant to GM food while it happily swills down alcopops. The problem in the actual report was – as it often is – to set up a scientist against someone with no hard facts but a strong sense of personal rectitude. A 2010 poll carried out with the support of Friends of the Earth claims to show that two thirds of the British public still “want GM to be kept off their plate”. In this debate, emotion and disinformation have prevailed; certainly one should be free to dismiss GM, but on a real rather than an imaginary basis. The item did nothing to restore that balance, and, remarkably enough, a spokesman for Friends of the Earth with whom I discussed the issue agreed that some of the information put out by his organisation on this topic was wrong and that he regretted the fact.

Other debates on contentious issues have been more successful. On 4th January 2011 Pallab Ghosh generated a hard-hitting *Newsnight* piece in which he made the shocking revelation that homeopathic vaccines against malaria, polio and typhoid are still on sale. The item was, he said, a follow-up to his report on the same subject four years previously which led to action by the pharmaceutical licensing bodies although this was never carried out. He also dug out the remarkable fact that homeopathic remedies used on

animals cannot legally be described as medicines, but that those used on humans can. This was science reporting at its best and was accompanied by a calm and well-moderated debate between the President of a homeopathic regulatory organisation – who made a reasonable defence of her own case, refuting some of the claims made – and the science writer Simon Singh in which the latter, in my view at least, defeated her argument (although other viewers might disagree).

In this case, and in other examples of science reporting, the BBC often provides public service with information and with debate in which both sides of an argument are presented and the evidence allowed to speak for itself. Too often, though, the non-governmental bodies it turns to in such discussions have a social and political, rather than a scientific, agenda. They have every right to promote their views, and some do sterling work. Even so, constantly to invoke them in opposition to researchers can lead to bizarre mismatches. The BBC would not have a discussion between a centre-forward and an opera critic but some of the discussions, like that on GM potatoes, have been almost as surreal.

The Matter of Phone-Ins

Such problems become acute when dealing with radio phone-ins where, inevitably (and as is accepted in the BBC guidelines), some leeway must – given the unpredictability of those who choose to take part – be accepted in the matter of balance. Such programmes are, of their nature, hard to moderate, as anyone, however eccentric their views, can attempt to put their voice on air. The Corporation is aware of this and, in its Editorial Guidelines, points out that those in charge should be ready to deal with contributions that may cause widespread offence or break the law. In science, there should surely be some attempt to balance the often eccentric views put forward, but sometimes that does not happen. Presenters are, in general, adept at challenging false claims about political or social issues, but may find it harder to do so when faced with a barrage of calls about astrology and the like, with no matching voices from those expert or even reasonably informed, who are in any case less likely to participate than is a passionate outsider. The matter is not easy to deal with, but it might help to use a presenter with some expertise, or to insist on some qualified voice of opposition to mitigate the anti-science bias which

some items in this format have shown.

Radio 4's *Call You and Yours* has had items that debunk junk science. It dealt well with the false claims that fish oils improve school test scores or that dyslexia can be treated with muscle exercises. However, it occasionally struggles against a determined onslaught from activists. On 23rd February 2010, the topic was herbal medicines. There was, as is normal practice, a "set-up" piece on the previous day that introduced the subject and included an interview with a scientist who pointed out the potential dangers of some of these substances. This was detached from the main programme itself and it seems probable that many of those who listened to the main item had not heard this item. In the phone-in the only expert present was Michael McIntyre, Chair of the European Herbal & Traditional Medicine Practitioners Association and an advocate of that practice (the producers tell me that they had invited a scientist with an alternative point of view but that he was unable to come). The programme included a series of anecdotes from people who claimed to have been cured of various conditions by alternative medicine, with few voices to point out that every medical college in the UK and the vast majority of doctors and scientists consider most of this field to be nonsense, and sometimes dangerous nonsense. Several speakers thought that their activities should be regulated – but this is not an oppositional view, but a key demand of homeopaths who wish to see themselves as an accepted part of the medical profession. Although it was pointed out that some conditions could not be treated with herbal medicines, just three or so of the live phone-in comments were critical. Phone-ins are difficult to control, but the presenter here – or his producer – appeared to me to find it hard to identify the inaccuracy of the claims made and hence unable to generate due impartiality.

This programme clearly faced a dilemma. In its attempts to reflect the spectrum of opinion among those who called in, rather than that of the medical profession as a whole, it seemed to me to breach at least the spirit of the editorial guideline that "a breadth and diversity of views should be sought and the requirements of due impartiality should be met". In an interactive forum this is a considerable demand but, once again, the fact that medical science turns not on a balance of beliefs but of evidence was not made clear. More attention should be placed on the importance of impartiality, even incomplete impartiality, in such presentations. The producer tells me that there was an

unexpected excess of calls in favour of herbal medicine but programmes such as these must surely be aware that they are likely to attract attention from those with fixed views. I discuss this item not to criticise the phone-in format – which can work well where politics, policy, and matters of opinion are involved – but to emphasise once again the difficulty of weighing up the opinions of those determined to believe even in the absence of evidence against those of science, which turns absolutely on that commodity. Once again, equality of voice is essential – and I await with interest the effects of the “due weight” criterion on this type of programming.

Man-made global warming: a microcosm of “false balance”?

A belief in alternative medicine or in astrology and a fear of vaccines or of GM food are symptoms of a deep mistrust in conventional wisdom. Such scepticism should be part of every scientist’s, every journalist’s or every politician’s, armoury. However, mistrust can harden into denial. That faces the media with a problem for, in their desire to give an objective account of what appears to be an emerging controversy, they face the danger of being trapped into false balance; into giving equal coverage to the views of a determined but deluded minority and to those of a united but less insistent majority. Nowhere is the struggle to find the correct position better seen than in the issue of global warming²².

The topic illuminates some of the weaknesses – and of the real strengths – of the BBC’s attempts to report science. News of the Trust’s decision to commission this Review was greeted by some anti-global warming enthusiasts as a statement of its desire to haul the Corporation over the coals for supposed failings around this topic. Nothing could be further from the truth: this is one of a regular series of evaluations of its output. I have had a number of communications from the public on this issue and the BBC has received many complaints about alleged weaknesses in its treatment of the subject. Many emerge from an organised response by determined climate-change deniers rather than being objective disagreements with particular programmes. Thus, *Climate Wars* (broadcast on 14th September 2008) had 88, the news coverage of the East Anglia e-mail “scandal” at around that time got 122, *Panorama*’s “What’s up with the Weather?” of 28th June 2010, just 45; *Horizon* on “Science under Attack” (24th Jan 2011) 101, and the *Storyville*

documentary of 31st Jan 2011 “Meet the Climate Sceptics” stimulated 67 written complaints. There has in addition been a drizzle of criticism of BBC coverage of the topic in some newspapers, much of it arising from a handful of journalists who have taken it upon themselves to keep disbelief alive. This barrage of criticism by one side of the argument (matched, to a lesser degree, by complaints from those who believe that man-made global warming is real) shows that the BBC is at least annoying both parties to the debate and is achieving a measure of impartiality by so doing.

Even so, the coverage of this topic, and the tone of some reports, has led to many comments during my Review. In some ways global warming shows how hard it is reach due impartiality in the treatment of science and how the BBC in its attempts to do so may inadvertently achieve almost the opposite.

One of my interviewees described the BBC as having been “scarred” by this controversy. I saw no sign that such a term is justified, but the Corporation has certainly put plenty of effort – and resources – into its attempts to be impartial. There have been seminars with high-profile speakers, there exists a Climate Change Steering Group and there have been lengthy discussions of those involved with the BBC’s Environment Analyst. He made it clear to us quite how seriously the issue was taken, how hard it has been to persuade people to understand estimates of risk (upon which much of the argument turns) and how much better politicians, self-publicists and paid pundits are at forensic oratory than are the scientists invited to state their case. Global warming raises questions of the reporting of science, of policy, and of scandal and deserves a closer look.

Before discussing the subject in detail it may be worth putting the mind-set, and the tactics, of some (but not all) proponents of the idea that global warming is a myth into context.

They, with many others, practise denialism: the use of rhetoric to give the appearance of debate. This is not the same as scepticism, for a sceptic is willing to change his or her mind when provided with evidence. A denialist is not. Many among them see themselves as intellectual martyrs in a war against political correctness and as worthy successors to Galileo. Whatever the claim – AIDS has nothing to do with viruses, the MMR vaccine is unsafe, complex organs could never evolve, or even that the 9/11 disaster was a US

government plot – the syndrome has some consistent themes.

The tale is told of a vast conspiracy to hide the truth and of dissent quashed by secret forces. People with strong opinions should be given equal weight with experts. Any evidence that contradicts their ideas must be publicised and the rest ignored, while any statement of doubt about conventional wisdom is trumpeted from the rooftops. Standards of proof should be set so high as to be impossible to attain. Personal attacks (Hitler was against smoking) are acceptable and absolutism is useful (one ninety year old smoker proves that tobacco is harmless). Doubt shades into certainty: a scientist can never be sure that a vaccine is always safe – which means that it never is. Often, the proponents unite into a movement that can, in these electronic days, bombard its enemies and give the impression of being far larger than it really is.

Most important in the context of this Report, any concession by the establishment that it is less than certain of the accuracy of its claims – that there is, in other words, room for discussion – is taken as a statement of surrender. Because so much of science involves uncertainty, it is open to attack from those who have never experienced that sensation. Purity of belief makes it easy for denialists to attract the attention of news organisations but hard for them to balance their ideas against those of the majority. This can lead to undue publicity for views supported by no factual information at all.

In its early days, two decades ago, there was a genuine scientific debate about the reality of climate change (although that attracted rather little attention). Now, there is general agreement that warming is a fact even if there remain uncertainties about how fast, and how much, the temperature might rise. At present, the pessimists are in the ascendant and today's increase in floods and snow (as predicted for a warmer atmosphere which can take up more water) is on their side. A debate remains, and it deserves to be reported with as much objectivity as would any other unresolved issue.

Twenty years ago, an American organisation began to send out press releases denying the truth of warming on various grounds (none of which have they supported by publishing their data in the scientific literature). This whipped up a media storm. On one side are the deniers, most of whom hold libertarian views, while on the other are the alarmists, usually from the left. The BBC has shown signs of being trapped in the middle.

Accusations of bias fly, together with claims of fraud (a simplification of an image for the cover of a report means that climatologists are doctoring a graph to hide global cooling, a single mistake in a report about Himalayan glaciers is evidence of a conspiracy to exaggerate the impact of greenhouse gases). Media attention switches to scandal rather than to evidence. In the furore, the crucial point that there is always doubt in science, particularly when it tries to look into the future, and that to be uncertain does not inevitably mean to be wrong, is lost.

Where policy is concerned, the argument is far from resolved. Science can inform the debate, but policy implications of global warming remain a legitimate part of the news agenda. In its submission to this Report, the Global Warming Policy Foundation (active in casting doubt on the truth of man-made climate change) told me that they are producing a review with a focus on climate science and science policy. As they say, "... it is one thing to get basic science facts right yet quite another to promote (or criticise) particular science policies". That is a reasonable point and they should, no doubt, have a voice in this debate. All of us involved in this debate need to remember that we are entitled to our own opinions but none of us are entitled to our own facts.

That is not the case for warming itself, for the evidence is overwhelming. Starting in 1959 with measurements on Hawaii it is clear that the amount of carbon dioxide in the atmosphere is rising. Ice cores shows that for half a million years before the Industrial Revolution its level fluctuated between 180 and 300 parts per million. Since around 1800 it has risen from 280 to 390 parts per million; a 40% increase. Basic physics shows that carbon dioxide is a greenhouse gas. There have been many computer models of what may happen in future, and although there remains controversy as to how much the feedbacks – melting ice, rising seas, dying plants – will multiply the direct effect of the gas, almost every climatologist predicts a period of rising temperature. Three independent sets of records of global temperature agree that 2010 was one of the three hottest years since figures were first collected and that nine of the ten warmest years on record have been since 2000. To bring matters up to date, 2011 saw the warmest April in Central England for 350 years.

A 2008 survey to which thousands of Earth scientists responded found that 90% agreed

that temperatures have risen since 1800 and that 82% consider that human activity has been significant in this. 96% of specialists in atmospheric physics agreed with the first statement, and 97% with the second²³. Truth is not defined by opinion polls but it is difficult to deny the consensus. Its extent is clear from an open letter to the journal *Science* by two hundred and fifty members of the US National Academy of Sciences: “(T)here is compelling, comprehensive, and consistent objective evidence that humans are changing the climate in ways that threaten our societies and the ecosystems on which we depend. Many recent assaults on climate science and, more disturbingly, on climate scientists by climate change deniers are typically driven by special interests or dogma, not by an honest effort to provide an alternative theory that credibly satisfies the evidence.”

A poll carried out by the Cardiff University Understanding Risk Group in early 2010 showed in contrast that one in seven among the British public said that the climate is not changing and one in five that any climate change was not due to human activity. Fewer than half considered that scientists agree that humans are causing climate change²⁴. The divergence between the views of professionals versus the public may be seen as evidence of a failure by the media to balance views of very different credibility. The BBC is just one voice but so many in Britain gain their understanding of science from its output that its approach to this question must be considered.

Much of it has been exemplary, with the investigations of Roger Harrabin, its Environment Analyst, in particular following every twist and turn in the argument. The BBC itself has accepted in an internal document that the balance of debate has changed. In an Impartiality Report submitted to the Trust in 2008 the Executive noted that: “The centre ground in climate science has shifted markedly. One main reason for the change in global opinion was last year’s resolution of the most fundamental questions in climate science by the Intergovernmental Panel on Climate Change, the world’s official climate change assessment forum. The IPCC concluded that it is beyond doubt that the climate is warming and more than 90% likely that this has been driven by human activity. Given the weight of opinion building up around the IPCC it makes sense for us to focus our coverage on the consensus that climate change is happening, is serious, but is manageable if tackled urgently...”

These are welcome words but it is not clear to me that they have percolated through the BBC. The presentational style of some coverage since that Impartiality Report has continued to suggest that a real scientific disagreement was present long after a consensus had been reached. Jeremy Vine's introduction to a 2010 *Panorama* makes the point: "What's up with the weather?": "Does anyone believe the claims anymore? ... A freezing winter and allegations that the scientists have misled us have set the experts at loggerheads". That antagonistic statement is typical of how the agenda on climate change is sometimes set. It suggests that there are two equally valid points of view that must be sorted out – ten years after consensus had been reached that (whatever the cause) climate change is happening. The *Panorama* programme itself came up with a remarkable revelation: that Bjorn Lomborg, previously a major sceptic, was now in accord with most climatologists. This was a telling statement – but to present it in "debate" format was to set up a false balance; to return to the seesaw ("on the one hand, on the other") that has plagued this topic. The real discussion has moved on to what should be done to mitigate climate change. Its coverage has been impeded by the constant emphasis on an exhausted subject whose main attraction is that it can be presented as a confrontation.

As the Content Analysis indicates, there was a (to put it kindly) nuanced News and Current Affairs treatment of the 2010 Muir Russell Report on the University of East Anglia's "Climategate" story. The report's findings were, in order, that the honesty of the scientists involved was not in doubt, that the Intergovernmental Panel on Climate Change's conclusions were not undermined by their work, and that they had been insufficiently open about the presentation of some of their data. The major point was the acceptance of scientific accuracy – but most news reports led on the last, openness, point; and most included a substantial contribution by climate sceptics whose claims had been refuted rather than accepted by the Report itself. *Newsnight* had a lengthy discussion in which a prominent climate change denier spoke first, last, and for the longest time although the piece was reporting the dismissal rather than the acceptance of his claims.

The impression of active debate is sometimes promoted by statements that are not supported by the facts; that (in a March 2011 *The Daily Politics* show) 95% of the carbon

dioxide in the atmosphere comes from natural sources, while in fact human activity has been responsible for a 40% rise in concentration, or (a November 2009 *Today* programme) that volcanoes produce more of the gas than do humans (the balance is a hundred times in the opposite direction). For at least three years, the climate change deniers have been marginal to the scientific debate but somehow they continued to find a place on the airwaves. Their ability so to do suggests that an over-diligent search for due impartiality – or for a controversy – continue to hinder the objective reporting of a scientific story even when the internal statements of the BBC suggest that no controversy exists. There is a contrast between the clear demands for due impartiality in the BBC's written guidelines and what sometimes emerges on air.

Things are, perhaps, improving. Lord Monckton is, without doubt, a man who adds to the gaiety of nations and is a skilled communicator of his views. However, a recent BBC Four investigation ("*Meet the Climate Sceptics*", *Storyville*, 31st Jan 2011) of his activities made his isolation from mainstream beliefs very clear. A 2011 *Horizon* in which the President of the Royal Society interviewed other climate sceptics also revealed their marginal position. A submission made to this Review by Andrew Montford and Tony Newbery (both active in the anti-global-warming movement, and the former the author of *The Hockey Stick Illusion: Climategate and the Corruption of Science*) devotes much of its content to criticising not the data on temperatures but the membership of a BBC seminar on the topic in 2006, and to a lengthy discussion as to whether its Environment Analyst was carrying out BBC duties or acting as a freelance during an environment programme at Cambridge University. The factual argument, even for activists, appears to be largely over but parts of the BBC are taking a long time to notice.

The climate story has lessons about impartiality that could be useful in a wider context. It promotes the essential lesson that science is a process and not a result, that as information grows its narrative can alter and, occasionally, may even change direction. Uncertainty is part of the system and often means that a discovery can be stated only in terms of probability. Unlike the deniers, scientists accept that they could be wrong. To do so is not to admit that they are dishonest.

Defining impartiality: is science different?

There are divergent views within the BBC as to the interpretation of what due impartiality actually is, and of how it should be applied to science. These may in part be resolved by the newest versions of the published guidelines, but as the programmes discussed here were made under earlier versions there is little evidence as to how well or otherwise the revised document might function. The Bridcut report itself says that: “[Impartiality] remains an evolutionary process, and ... it has an important and stimulating role to play in a more diverse society, where many of the old certainties and shared assumptions have melted away ... it has to be more than a mantra it must be both rigorous and thoughtful”. Many felt that when it comes to the area under discussion in this report, a little more attention to that last word would be a help.

So central is this disagreement that here I name some of the protagonists and – with their approval – quote the arguments used on either side of the case (inevitably, these quotations are extracted from a series of longer and more nuanced discussions).

Some are unyielding in their commitment. Every view, however inconsequential, needs at least to be considered for possible inclusion. Helen Boaden, Director of BBC News was clear: however essential it might be to strike the right note, or the right weight, or the right degree of attention, or the right outlet for a particular report, exactly the same criteria must apply as to politics, sport or anything else. Occasionally impartiality on a particular topic was at fault because the BBC did not know enough about the facts; but that was true for every area of reporting. While we were discussing the failure of news organisations to report the Australian work on what had seemed the eccentric notion that stomach ulcers were caused by bacteria rather than by stress, I suggested that the Australian scientists should have been given a voice (easy with hindsight, for they won the Nobel Prize) but that someone who claimed that the illness was due to demonic possession should be ignored. To do that might indeed seem absurd, but Helen Boaden pointed out that she had in the past reported on the African HIV epidemic and it was quite legitimate to mention that some locals believed that witchcraft was to blame for that was a real part of the story: there were circumstances under which all opinions, eccentric or otherwise, deserved consideration. When it came to impartiality, context was all. What might not be suitable for a *Ten O’Clock News* piece could feature in a Radio 5 Live phone-in.

Ceri Thomas, Editor of the *Today* programme had much the same view. He felt, rightly, that most of his science coverage was fair and balanced and that, although occasionally it seemed disputatious scientists should realise that his is a news programme and not a technical debate between experts: “the science establishment needs to give ground as much as we do”. Journalists have a natural wish to challenge orthodoxy – and if orthodoxy is right, it should be able to see off its critics as, indeed, in many scientific disputes, it has. James Stephenson, of the Television News at Six and at Ten agreed: marginal opinion has a place, although a small one, in all news output, and there is no reason why contentious areas of science should not follow that rule.

Tom Giles, Editor of *Panorama*, considered that it was the role of his programme to expose scientists to broader scrutiny than they might be used to, and that although it specialised in controversial subjects (in science as much as anything else) *Panorama* generally succeeded in avoiding bias. Sometimes – as in a 2007 episode on ADHD “*What Next for Craig?*” (judged by the Editorial Standards Committee to have failed to meet the requirements of impartiality) - the balance had gone wrong, but over the broad range he felt that the guidelines worked well. Their programme on the dangers of the diabetes drug Avandia, for example, as reported by Shelley Jofre, presented both sides of the argument but in the end contributed to it being withdrawn. The science reporter Pallab Ghosh referred to Brian Cox’s description of astrology as “rubbish”. The problem, in Pallab’s view, was the use of that word, which was unnecessarily emotive. He would have said instead that “there is no evidence that astrology works”, which would have been within the guidelines and made the point equally well.

Although many senior people in News and Current Affairs had a positive view of the approach to impartiality, there were dissenting voices. One described the Corporation as an adversarial organisation in an adversarial society, almost addicted to an approach that did not serve science well. Jana Bennett, at the time Director of Vision, who has experience in both political and science broadcasting and was once Head of Science, considers that although the standard approach worked well in many areas, science was a different enterprise. It involved uncertainty. Its culture was not widely understood and the temptation to present conflicting views was submitted to too readily. So used is the public to balance in BBC reporting that they may gain the impression that in science too,

each viewpoint should be given the same weight. Programmes such as *Panorama* that deal with the implications of its advances differ from those such as *Horizon*, which are concerned with the science itself. There were also issues in arbitrating claims of bias, because all issues and opinions may not be equal. It is important for generalist programme makers to use expert advice although it may be hard for them to find it.

Andrew Cohen, Head of Science, London Factual, also considers that different criteria are needed for programmes such as *Horizon*. His series *Fix Me* turned on the hopes of three seriously ill people who might possibly be helped by stem cell technology. It concentrated on the research and not on the moral debate around the use of such cells – and was criticized as a result. The present guidelines, he felt, were of little help for they could be taken to imply that the emotional rejection of stem cell research felt by some people should be referred to in the programme although this is not relevant to the research itself. Kim Shillinglaw, Commissioning Editor for Science and Natural History on television also feels that too strict application of such guidelines would paralyse coverage of the topic. Many others active in non-news elements of the BBC had similar views.

I spoke also to Fran O'Brien, Head of Editorial Standards at the BBC Trust. An important element in assessing impartiality is, she felt, to consider the programme's remit. A Natural History piece on evolution would have no need to consider creationism, while a segment on religion and science might find it necessary to discuss the subject. One needs also to be aware of the audience. Often – perhaps always – it is necessary to simplify a scientific story for a general audience and although this might be interpreted as bias by experts, to include all possible details and caveats is simply impossible. The concept of "due" impartiality is also important; that does not require absolute neutrality on every issue and – in the context of general reporting – one would not give equal time to a terrorist organisation simply to reflect their existence. A certain amount of common sense is called for here and, in her opinion, the BBC usually applied it. She pointed out also that the recent guidelines drafted by the BBC and approved by the Trust make particular reference to "controversial subjects" – and there it makes the point (much discussed in the present document) that there must be a distinction between matters grounded in fact and those which are a matter of opinion. Due impartiality is a more subtle concept than it is usually given credit for.

Faced with such divergent views I spoke to John Bridcut himself. He told me that in his view the idea of impartiality has evolved and continues so to do. As he said, the BBC once saw itself as impartial in its reporting of the General Strike although no historian would agree with that today. One difficulty when dealing with a controversy is, he thought, to know when the debate is over. But his view is that while intelligent and articulate opponents remain it is not for the BBC to close down an argument, on climate change or anything else. Dissenters should be heard, even if not with equal time.

Proper discussion of science was, he thought, inhibited by a culture of generalism. The BBC Academy should build up expertise in science among presenters, reporters and producers to match that held in arts-based subjects and to reduce the use of an unduly aggressive and adversarial approach. It might also eliminate the futile search for a “middle way” between competing views and encourage their rigorous, evidence-based and cliché-free examination. He was emphatic that his “wagon wheel” referred to a fair and diverse expression of competing opinions, whereas established truths should stand in their own right. People sometimes confuse the two, so that strong and popularly held beliefs may be treated as objective facts. The BBC's Editorial Guidelines warn of the danger of treating “consensus or received wisdom as fact or self-evident”. To do so encourages complacency, which itself infringes upon impartiality. Science, he thought, needed just as rigorous an application of that term as did other factual subjects.

Some of these disagreements reflect, it appears to me, a divergence of view between those with, and those without, a background in science – or science journalism – itself. Many of the former feel that there has been too rigid an application, or at best a misinterpretation, of the central principles. One or two of my interlocutors even suggested that there should be a specific amendment to exempt science from a too rigid interpretation of the guidelines. Others say that to do so would allow opponents of any claim, from vaccines to stem cells to global warming to say that the BBC had defined itself as unwilling to accept criticism and that this would be too high a price to pay. I tend to agree.

There is no doubt that the majority of BBC news and current affairs science reports in *Today*, *Newsnight*, *Panorama* and elsewhere are clear, accurate and impartial. Against

that must be put the repetition of biased or uninformed views – vaccines cause cancer, global warming is a myth, GM foods are poisonous – in what purport to be objective accounts of a dispute. The BBC has many successes in presenting scientific disagreements in a non-adversarial manner. *In our Time*, for example, often looks in detail at particular topics in biology, physics, or chemistry, with dialogues among scientists who differ among themselves. This makes for excellent programming and is quite distinct from the insistence on debating points that mars some other output.

A quotation from Lord Salisbury: “If you believe the doctors, nothing is wholesome: if you believe the theologians, nothing is innocent: if you believe the soldiers, nothing is safe. They all require to have their strong wine diluted by a very large admixture of insipid common sense.” The BBC is good at serving up that bland confection and there is a need for more of it when reporting science. The balance of fact against opinion is central, and much of the perceived problem comes from failures to understand the difference between scientific evidence and political rhetoric. A change to the impartiality criteria is not called for but a certain application of common sense in deciding when to give air-time to anti-science may be advisable. The “climate wars” story and its relatives have lessons for the use of impartiality within the Corporation as a whole.

Of course, in science the contrarians are sometimes right. In physics, a highly qualified minority of experts now argues that Einstein’s special relativity – the bit that depends on the speed of light being constant – is wrong. If they are right, their subject will – again – have to go back more or less to the beginning and start again. So far they have not managed to get on to the News.

THE ROLE OF PARTNERSHIPS

Many of the BBC's most successful documentaries are made as co-productions with a variety of foreign partners, the US Discovery Channel among the most prominent. The Terms of Reference of this Report ask whether the partnerships and financial models used to create content compromise the approach to impartiality and inaccuracy. So far as I have been able to find out, they do not. The Natural History Unit, with its extensive – and expensive – coverage of fascinating creatures in remote places frequently enters into such deals, some of which cover as much as 40% of the total budget. As “re-versioning” for an American audience costs a lot, the interests of that audience have to be considered. Some felt that the acceptable level of science was as a result reduced but this may reflect no more than a general move towards more entertainment-based presentations of the natural world. I also heard of a certain reluctance by American co-producers to show graphic sexual imagery or to dwell too attentively on the theory of evolution, but there was little concern that this inhibited output aimed at the UK audience. In addition, it appears that, on rare occasions, and on particular topics, Discovery feels that some NHU output strays too closely into campaigning territory (always anathema to an American broadcaster) and has either commented upon, or edited out, such material. Again, this does not influence the version that is transmitted to a UK audience.

Horizon co-productions tend to undergo more revision by a foreign partner for they often have to accord with advertisement breaks. In some cases, indeed, a separate version is shot by the production team, perhaps omitting the presenter: but as far as the British audience is involved it seems that such external modifications have no effect on the bias or otherwise of the programme.

The independent production companies I consulted also saw few problems. If there was a complaint it was that the BBC was stricter in policing impartiality than was Channel 4, which suggests that the system is working well.

The BBC is increasingly involved with co-productions with the Open University. These are seen as a success and there was no suggestion of a breakdown in balance here either.

BBC SCIENCE ON THE WEB

The BBC has an extensive presence on the World Wide Web (the Natural History Unit being particularly active in this regard) although this is being reduced. As a result, some of those once fully occupied with web coverage have now been deployed as correspondents across radio and television as well, while the latter now have input into what appears on the web. Some protagonists feel that this has made lines of command less clear than in the previous system and has impeded the free flow of information. Although the web content was provided by those with expertise in science and technology, non-specialists were now adding science items to the relevant pages. That sometimes led to the appearance of weak stories, not checked by experts. In April 2008 one BBC reporter made the absurd claim that a powder (what the inventor called a “pixie dust”) had been discovered that would allow damaged fingers to grow back – a statement that would be dismissed by anyone with the slightest knowledge of developmental biology. That found its way on to the BBC News Channel website (the *Today* programme, in a report on media coverage of the story, pointed out that the work was grossly overstated).

Adherents of the web tend to be interested in technology, and the BBC pages do cover this. Much of this does seem to be rather concerned with “gadgets” – new mobile phones and the like – rather than with more substantial technology. The spokesman for Engineering UK made the point that, in spite of reasonable general treatment of his field by the BBC, it rarely appeared in web material, in spite of its intellectual standing and economic importance. There are real opportunities for integration of the web material with broadcast output and I felt that perhaps this could be more effective than it is at present; perhaps, one interviewee suggested, with increased footage from edited-out material from the Natural History Unit or the Science Unit which would, in these days of fast broadband, be of interest to many.

Some of the problem may lie with the barriers between those responsible for the broadcast material and those with online interests; quite often, it seems, links are made available to the web pages late or not at all, which reduces the extent to which integration is possible. Several of the scientists to whom I talked suggested that links to

outside sources such as journals or university web pages could also be beefed up for those with an interest in a topic who wanted to learn more and might themselves wish to comment upon it. The Content Analysis notes a certain shortage of links between news items and the BBC website.

A number of science, environment, technological or medical blogs appear under a BBC rubric. They add depth to existing stories, come up with new material, or range beyond straight reporting. They do, though, appear rather rarely, sometimes with just one or two items a month (although there are occasional spikes when particular stories lead), which may suggest that an already over-worked correspondent may find it hard to find time to keep them up to date. They are often accompanied by comments from readers which appear, in most cases, to be more balanced (or less overtly unbalanced) than those that sometimes follow such items in newspapers. This seems to reflect the nature of the readership rather than editorial interference for there seem to be no more deletions from the “comments” section than is the case elsewhere.

The World Wide Web is central to the scientific enterprise, and much of the audience with an interest in the subject are adept at accessing it, as the numbers of hits on some of the relevant BBC sites show (although the Content Analysis suggests that the blog pages are perhaps less popular than are those from non-science correspondents). The Corporation should be as thorough at policing accuracy and impartiality in this medium as it is in others, in the presentation of science stories by generalist correspondents most of all.

SCIENCE COVERAGE AND THE NATIONS

The Terms of Reference of the Review ask whether output has due regard to the devolved nature of science policy in the UK and calls for attention to be paid to the views of the separate Nations. I visited Cardiff, Belfast and Edinburgh in an attempt to ascertain them and in each place met a group of local participants. The discussions were informative, although many of the points raised were identical to those brought up elsewhere and have been subsumed into other sections of this report. All three felt that local coverage of science was weak and should be improved, but this Review is concerned with networked material only and I discuss this no further.

There were some complaints about the networked coverage of devolved science and science policy, with a certain disquiet that the extensive research carried out in each of the Nations did not get sufficient network attention. The Content Analysis also takes note of this. In its survey period, 22 English universities were mentioned in broadcast material, one from Scotland and none from either Wales or Northern Ireland (although five mentions were made to American universities). In addition the Nations interviewees commented that sometimes a particular national interest had not been reported; thus, the decision by the Welsh Assembly to ban a planned badger cull reveals a contrast in the scientific decisions that might have had more UK-wide attention.

Belfast and Cardiff perceived that as relatively small production centres certain topics were, “squeezed out”; and that science seems to be a victim of this. The Edinburgh interviewees were more sanguine for BBC Scotland has considerable production expertise in this field and provides networked programmes to a variety of outlets, from the *One Show* to *Jimmy’s Food Factory*.

The Belfast group noted that although there was huge investment in, for example, aircraft technology in Northern Ireland little of the science and engineering involved emerged in networked broadcasts. The BBC seemed uninterested in local science-based industry – and industry equally uninterested in getting into the UK-wide domain. Cardiff, too, felt that there was little involvement by Welsh universities in bringing their work to attention, and that BBC Wales itself was not pro-active in searching out Welsh science stories, even those that might be of UK-wide interest.

Many of those in the three devolved capitals (but, oddly enough, none of the London-based informants) were struck by the preponderance of interviews given by people from within the “Golden Triangle” of science delineated by Oxford, Cambridge, and London. The Content Analysis supports their view: just one of the top seven organisations that acted as a source for broadcast news – the University of Edinburgh – was outside that part of the UK. For non-news presentation of science, too, almost half of all programmes had contributions from within the famous triangle. Only two universities of the top ten sources (the Universities of Manchester and Bristol) fell outside the South-East of England. Certainly there is a concentration of scientific activity in that region, but there was a strong feeling of undue representation of its scientists, perhaps because they are easily accessible.

In our conversations there was agreement that science is somewhat of a nation in its own right and that national issues are of less import than they are in, say, politics, sport or health. There does, nevertheless, appear to be somewhat of a dearth of science stories from the Nations and outside the South-East of England in the BBC’s networked output. The consistency of view across the three Nations suggests that this marks a real gap.

THE FUTURE OF COMMUNICATION WITH SCIENTISTS

In the end, science journalism – its lack of bias and dependence on accuracy more than anything else – depends on speaking to scientists. The BBC has always had good contacts with some among that group. Even so, a large proportion of the profession remains, for a variety of reasons (a simple lack of interest included) quite disconnected from the media. Just possibly, everything is about to change. I end this review with some suggestions as to how the BBC might, in its search for completeness and impartiality, take advantage of this.

A plethora of governmental and other initiatives are now attempting to improve the public diffusion of science. They are widely dispersed and – useful as they might be to the BBC – are perhaps not as well known as they might be.

British universities have, over the years, been subject to endless inspections, justifications and reports. The “Research Assessment Exercises” consumed thousands of hours of academic time. They have been replaced by a “Research Excellence Framework” (REF) whose first assessment begins in 2011 with the results to be published in 2014. Its central criterion is accountability for public investment. The REF includes a new and explicit commitment to assess “impact, including benefits to the economy, society, culture, public policy and services, health, the environment, international development and quality of life”. To achieve this, the REF will examine “benefits arising from engaging the public with research”. It enjoins scientists to make a case that public engagement has increased the impact of their work²⁵. Although no formal statement has been made as to the weight put on that element, some reports say that it will be 10% of the total – a substantial proportion. This decision is intended to mark a new era in which scientists are obliged, to justify their funding, to interact with the public, through the press, radio, television and other outlets.

The BBC should be aware of this for it provides new opportunities for contact with the community and could reduce the criticism of incomplete coverage brought on by its present limited access to its raw materials. Such developments might on the other hand raise a subtle threat to impartiality, for if scientists’ funding is indeed dependent on their relationships with the media the Corporation must be careful to ensure that appropriate

balance is applied.

BBC reporters do of course visit laboratories at present, and many have close relationships with individual scientists although, in News at least, time constraints make it difficult to take full advantage of them. In some parts of the Corporation this process has gone much further. BBC Scotland has an internship programme with local universities, with at least one postgraduate student undergoing work experience at all times. This has proved invaluable to both parties. In addition the group has away-days to which it invites both scientists and production staff, and these too have been successful. Such events are in part paid for by Research Council funds that emerge from their Concordat for Engaging the Public with Research²⁶ and are aimed to encourage those with grants to do something to make their work public. BBC Scotland also gives media training and this leads to further useful collaborations. There are similar arrangements elsewhere within the Corporation, such as the attachments of junior, and sometimes of more senior, scientists offered by the Radio Science Unit and the short fellowships offered by BBC News to the British Science Association that brings in external scientists to News and to the Radio Science Unit. There is also the Ivan Noble bursary, a six-month internship offered to a scientist who has little or no journalistic experience.

All this is valuable, but further opportunities are about to arise. Now may be the time for the BBC to take a more integrated look at the opportunities that are, and those that are about to be, available to improve contact between the scientific and the media communities. Some have a high profile and some are more subtle, but it might be useful to the Corporation to put this diversity of sources together in a single location where they can be seen by both the parties interested in closer collaboration.

In 2011 the Wellcome Trust – a major funder of biomedical research – begins a scheme that gives its postdoctoral fellows the chance of a one-month placement with the BBC in the hope of developing a cadre of people able to work at the interface of medical science and broadcasting. It also has a series of Engagement Fellowships to encourage researchers to take part in such activities²⁷. The Media Fellowships on offer from the British Science Association, support up to ten researchers per year, for one to two months working in partnership with a media outlet, are similar²⁸. Such initiatives might

be used to draw on a wide range of scientific opinion in the search for impartiality. They should be publicised within the Corporation and the BBC might consider drawing up and circulating a central register of potential contacts from this and other sources.

Not all the attempts to promote such links have fulfilled their potential. The Wellcome Trust, Research Councils UK and UK Higher Funding Councils have together launched a multi-million pound scheme for six “Beacons of Public Engagement” (of which University College London is one) to support the public understanding of science²⁹. In our experience most of the interest has come from internal staff, with rather little contact with the BBC (although the Beacons have offered to provide answers for questions posted on the *Bang Goes the Theory* website and have carried out a test study of the Lab UK project that asks the public to participate in experiments linked to *Child of our Time* and *The Virtual Revolution*).

Some academic leads tell me that they feel that the BBC is rather reluctant to approach, or to respond to, their own initiatives. Birmingham University’s Ideas Lab³⁰ – supported by the Higher Education Funding Council through its Innovation Fund – has established an open register of academics and their interests, from forensic archaeology to obesity, in an attempt to increase media attention. It includes online taster interviews with talented science communicators from the University, but this too has elicited little response.

Other less well-known sources of information are also available. Many of the BBC’s science presenters come from a university background and gained their abilities from lecturing to an (often indifferent) student audience. One useful outcome of the government inspections has been the insistence that students assess the talents of their teachers. This has produced a register of outstanding lecturers, some of whom might be useful to the BBC as sources of information or as interviewees.

There is in addition a clear need to improve the insight of its non-specialist journalists into science – into its methodology, if not into the full range of its facts. The *Science and the Media: Securing the Future* paper identifies more than eighty undergraduate journalism courses at British universities, but notes that they offer more instruction in sports reporting than in science and in any case that they are of little relevance to practising journalists. In addition Imperial College London has had, for twenty years,

Master's degrees in Science Media Production and Science Communication, while City University has recently established an MA in Science Journalism and there are other such centres in Cardiff and elsewhere that might provide appropriate training.

The BBC also plans to develop its in-house training. Its College of Journalism (“a learning site for BBC journalists, by BBC journalists”) has undertaken to “develop its online science training content”. It has recently established a science “topic” homepage on its website, which will include an account of the facilities and expertise offered by the Science Media Centre, essays by prominent scientists on the problems of science and health in relation to journalism and on the nature of peer review. In addition it will produce, with the collaboration of the Royal Statistical Society, a guide to understanding numerical data together with videos of regular training and discussion events, master-classes included. In an organisation “obsessed with the culture of the generalist” (as one of my interviewees put it) this is an important task and its existence should be brought to the attention of all those involved in science reporting. The College of Journalism’s parent body, the BBC Academy, has the stated aim to “put training and development at the heart of the broadcast industry by equipping companies and freelancers with the skills they need for a lifetime of employability in the ever-changing media landscape”. That landscape could learn a lot about balance and impartiality from the BBC and the Academy should ensure that the developments within the College of Journalism are widely publicised.

RECOMMENDATIONS

The BBC is to be commended for the breadth, depth and professionalism of its science coverage. I was impressed by its treatment, which has shown real progress over the past decade or so. To ensure continuing improvement I have some suggestions.

There should be more interaction among the elements of the BBC involved in science output. An improved tie between News and other centres is particularly important given its shortage of science specialists compared to its expertise in other areas. A forum of some kind, or a panel of experts, or even a post of “Editor, Science” within News or “Chief Scientific Adviser” across the whole Corporation might improve matters.

News stories do not penetrate into the main arena of science as much as they might and tend to be more reactive, and less proactive, than in other parts of its output. Non-news coverage, too, might gain from a deeper look into the technical literature. I suggest that the BBC takes advantage of the electronic tools universally used by scientists themselves by subscribing, at modest cost, to one of them.

The Corporation covers policy well, and does the same for science. There are, though, opportunities for more interaction between the two. Some channels are rather light on science coverage and this could be improved.

There is much debate within the BBC about impartiality as applied to science, with rather a split between its science specialists and its other elements. There may sometimes have been an over-rigid application of the guidelines to what is essentially a fact-based field. This can produce an adversarial attitude to science which allows minority, or even contrarian, views an undue place. The BBC has tried hard to find a suitable balance. I await with interest the results of the new Guidelines’ emphasis on “due weight” when making editorial judgements about impartiality. Whatever their influence there should be no attempt to give equal weight to opinion and to evidence.

The BBC should keep a watching brief on developments in science communication that arise from changes in funding policy. An active approach to new avenues of engagement with scientists would benefit both parties.

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26) <http://www.mailngm.co.uk/13/link.php?M=1368219&N=1013&L=1671&F=T>

27) <http://www.publicengagement.ac.uk/about/beacons>

28) <http://www.ideaslab.bham.ac.uk/>

Figures

Fig. 1 National Origin and Interconnectedness of the World Scientific Literature

<http://www.mapofscience.com>

Borner, K. 2010. The Atlas of Science: Visualizing what we know. MIT Press

Fig. 2 The Geography of Highly Cited Science

Euro us map Batty M, 2003, "The geography of scientific citation" *Environment and Planning A* 35(5) 761 - 765

Fig. 3 The Map of Science: The Size of Each Field, and Who Refers to Whom

Rosvall, M., and Bergstrom, C.T. 2008. "Maps of Random Walks on Complex Networks Reveal Community Structure." *PNAS* 105, 4: 1118–1123. See also:

<http://www.eigenfactor.org/map/maps.htm>.

Fig. 4 Comparison of Coverage by Topic

ANNEX ONE: BBC EDITORIAL IMPARTIALITY GUIDELINE AS REVISED OCTOBER 2010

<http://www.bbc.co.uk/editorialguidelines/page/guidelines-impartiality-introduction>

ANNEX TWO: TERMS OF REFERENCE

This Annex is now published as a separate PDF on the Trust website, as Appendix B to the full review.

ANNEX THREE: GROUPS AND INDIVIDUALS CONSULTED DURING THIS REVIEW

A wide cross-section of opinion was considered, with a series of face-to-face and telephone interviews with groups and with individuals.

Group Meetings

Department of Energy and Climate Change:

Alison Conboy, DECC

Paddy Feeny, Director of Communications

Paul Hollinshead, Director of Science and Innovation

Dr Emily Shuckburgh, LWEC Science Policy Fellow

Peter Wilson, Chief Press Officer

Kim Worts, Head of Corporate Communications

House of Commons Select Committee on Science and Technology:

Gavin Barwell

Gregg McClymont

Stephen Metcalfe

Andrew Miller (chair)

David Morris

Stephen Mosley

Pamela Nash

Jonathan Reynolds

Alok Sharma

Graham Stringer

Roger Williams

Science Media Centre

Linda Capper, British Antarctic Survey

Prof Nick Craddock, Head of Psychiatry, Cardiff University

Fiona Fox, Director, SMC

Martin Griffiths, Royal Statistical Society

Sir Paul Nurse, Chief Executive, UK Centre for Medical Research and Innovation

Dr Allan Pacey, University of Sheffield

James Randerson, Environment and Science News Editor, The Guardian

Jo Revall, GlaxoSmithKline

Tom Sheldon, Engineering Press Officer, SMC

Ed Sykes, Press officer, SMC

Wales, Scotland and Northern Ireland

Wales

Prof Rudolf Allemann, School of Chemistry, Cardiff University

Karl Davies, Head of Governance and Accountability, BBC Trust, Wales

Dr Nick Fenwick, Farmers' Union of Wales

Lesley Griffiths AM, Deputy Minister for Science, Innovation and Skills

Prof Phil Gummett, Chief Executive, Higher Education Funding Council for Wales

Prof John Harries, Chief Scientific Adviser, Wales

Janet Lewis-Jones, BBC Trustee for Wales

Steve Wearne, Director, Food Standards Agency, Wales

Scotland

Prof Geoffrey Boulton, General Secretary of the Royal Society of Edinburgh, Regius Professor Emeritus and former Vice Principal, University of Edinburgh

Jill Fullerton-Smith, BBC Science Unit, Scotland

Simon Gage, Director, Edinburgh International Science Festival

Prof Anne Glover, Chief Scientific Adviser, Scotland

Prof Paul Hagan, Director of Research & Innovation, Scottish Funding Council

Marcus Herbert, BBC Executive Producer, Scotland

Allan Jack, Head of Governance and Accountability, BBC Trust, Scotland

Greg Lanning, BBC Executive Producer, Scotland

Dr Rak Nandwani, Consultant Physician, Genitourinary Medicine, NHS Greater Glasgow & Clyde

Prof Jon Oberlander, Professor of Epistemics, School of Informatics, University of Edinburgh

Jeremy Peat, BBC Trustee for Scotland

Prof Hugh Pennington, Emeritus Professor of Bacteriology, University of Aberdeen

Prof Wilson Poon, Professor of Condensed Matter Physics, School of Physics and Astronomy, Edinburgh University

Helen Thomas, BBC Executive Producer, Scotland

Northern Ireland

Dr Norman Apsley, Chief Executive Officer, Northern Ireland Science Park

Prof Alan Fitzsimmons, Astrophysics Research Centre, Department of Physics and Astronomy, Queen's University, Belfast

Dave Foster, Director of Environmental Protection, Northern Ireland Environment Agency

Dr Elaine Hicks, Member of BBC Audience Council, Northern Ireland

Rotha Johnston, BBC Trustee for Northern Ireland

Dr Michael McBride, Chief Medical Officer, Department of Health, Social Services and Public Safety, Northern Ireland

Prof Jim McLaughlin, Director of Nanotechnology & Advanced Materials Research Institute, University of Ulster

Paul McMenemy, Member of the BBC Audience Council, Northern Ireland

Direct Consultations: External Organisations and Individuals

John Bridcut, Author, *From Seesaw to Wagon Wheel: Safeguarding Impartiality in the 21st Century*

Tom Brisley, Darlow Smithson Productions

Mike Childs, Head of Climate Change, Friends of the Earth

Prof David Colquhoun, University College London

Paul Durbin, National Geographic Channel

Beth Elgood, Director of Communications, Engineering UK

Natalie Humphreys, Shine

Paul Jackson, Chief Executive, Engineering UK

Sir Roland Jackson, Chief Executive, British Science Association

John Lynch, former Head of Science, BBC Vision

Adam Rutherford, *Nature* magazine

Paul Sen, Furnace TV

Susan Winslow, Discovery Channel

Direct Consultations: BBC

Scott Alexander, Series Producer, Deadly 60, Natural History Unit

Mohit Bakaya, Commissioning Editor, Specialist Factual, Radio 4

Miles Barton, Series Producer, Frozen Planet, Natural History Unit

Jana Bennett, Director, BBC Vision

Richard Black, BBC Environment Correspondent

Helen Boaden, Director, BBC News

Chris Burns, Group Manager, Audio and Music

Dermot Caulfield, Editor, Bang Goes the Theory

Rory Cellan-Jones, BBC Technology Correspondent

Andrew Cohen, Head of Science, London Factual

Deborah Cohen, Editor, Radio Science Unit and 15 members of the Unit

Brian Cox, Presenter, BBC

Tim Davie, Director, Audio and Music

Harry Dean, Head of Editorial Standards and Complaints Management, BBC Vision

George Entwistle, Controller of Knowledge Commissioning, BBC Vision

Tom Feilden, Science Correspondent, Today

Tina Fletcher, Executive Producer, Bang Goes the Theory

Pallab Ghosh, BBC Science Correspondent

Tom Giles, Editor, Panorama

Roger Harrabin, BBC Environment Analyst

Julian Hector, Editor, Natural History Unit, Radio

Andrew Jackson, Head, Natural History Unit

David Jordan, Director Editorial Policy and Standards, BBC

Brian Leith, Executive Producer, Human Planet, Natural History Unit

Stephen Mitchell, Deputy Director, BBC News

Michael Mosley, Executive Producer and Presenter, BBC

Jonathan Renouf, Producer, BBC Science

Peter Rippon, Editor, Newsnight

Kim Shillinglaw, Commissioning Editor, Science and Natural History

David Shukman, BBC Environment Correspondent

Sandy Smith, Executive Editor, The One Show

James Stephenson, Editor, Six and Ten

Ceri Thomas, Editor, Today

Matt Walker, Editor, Earth News, Multiplatform, Natural History Unit

Fergus Walsh, BBC Medical Correspondent

Susan Watts, Science Editor, Newsnight

Gwyneth Williams, Controller Radio 4

ANNEX FOUR: ORGANISATIONS AND INDIVIDUALS RESPONDING TO LETTERS OF ENQUIRY

The Academy of Medical Sciences

The Association for Science Education

BAE Systems

British Ecological Society

Prof Dame Sally Davies, Chief Medical Officer

E.ON UK plc

GlaxoSmithKline

Global Warming Policy Foundation

Prof John Harries, Chief Scientific Adviser, Wales

Richard Horton (The Lancet)

The Institute of Mathematics

The International Broadcasting Trust

The Linnean Society

Lawrence McGinty (ITN)

Andrew Montford

National Science Learning Centre

Natural History Museum

Tony Newbery

Rolls-Royce plc

The Royal Academy of Engineering

Royal Meteorological Society

The Royal Society

The Royal Statistical Society

Scottish Agricultural College

Society of Biology

Society of Chemical Industry

Solvay Interlox Ltd

Dr Bob Ward, Grantham Research Institute on Climate Change, LSE

David Willetts MP, Department for Business, Innovation and Skills

ANNEX FIVE: CONTENT ANALYSIS

This Annex is now published as a separate PDF on the Trust website, as Appendix A to the full review.

LIST OF APPENDICES

The following appendices are available as PDFs at bbc.co.uk/bbctrust:

Appendix A: Imperial College London research

Appendix B: Terms of Reference for the Review